Upton Fuller

ARITHMETIC

Grade 5

This book was reprinted in 1951.
All original pages exist.

Clifford B. Upton and Kenneth G. Fuller

ARITHMETIC

Grade Five

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Introduction

The meaning theory of teaching arithmetic is the philosophy underlying the writing of these books. According to this theory, arithmetic should be so taught that the pupils understand it. This means clear and simple explanations of the fundamental processes of arithmetic, it means emphasis upon basic principles rather than mechanical rules, it means an understanding of our number system, it means rich motivation of all new processes in terms of pupils' interests, it means a wealth of real problems and projects, and finally it means enough exercises on each topic so that principles and concepts become meaningful through adequate practice in their use. This effective combination of principles and practice is found on every page of this series of arithmetics. And it is only through such a program of instruction that pupils can develop the ability to solve problems and to compute with ease and understanding.

The basic number facts that were taught in Grades 3 and 4 are carefully reviewed in this book since pupils can have no success in arithmetic until they have automatic mastery of all the 390 facts. For those pupils who have difficulty in remembering the harder multiplication and division facts, special helps are provided to aid in remedying such defects as may exist.

The work on problem solving incorporates the results of recent researches on the subject. These investigations have shown that one-step arithmetic problems can be classified into a limited number of thought patterns representing all the types of quantitative thought and language that are

possible in connection with each of the four fundamental operations. The problems in this book stress one-step and two-step problems and include all the thought patterns that are suitable for Grade 5. Many challenging problems are distributed throughout the text. In addition, there is a liberal number of interesting projects in which arithmetic is integrated with other subjects such as history, geography, science, agriculture, and industry.

A problem test made up of important types of problems with which the pupil should be familiar is included in each chapter. These tests serve to measure the pupil's ability in problem solving.

Long division with two-figure divisors is taught by a method of estimating quotient figures which gives the correct quotient figure on first trial in 80 per cent of all cases. In the remaining 20 per cent of cases, the correct quotient figure is found, with minor exceptions, after a single correction of the trial quotient figure. The procedure so often found in schoolrooms, by which the pupil tries first one quotient figure and then another until he finds the correct one, is thus avoided.

The work on the addition and subtraction of fractions covers cases with like and unlike denominators. When the denominators are unlike, the problems stress those cases where one of the denominators is also the common denominator since such cases are the ones usually met in practical applications. The work on multiplication is confined to the multiplication of fractions and whole numbers. The multiplication of fractions by fractions and also the division of fractions are postponed until Grade 6.

An introductory treatment of decimals, limited to the addition and subtraction of one-place and two-place decimals, is included since the use of decimals in everyday life is steadily increasing.

The explanations of the fundamental processes are given in simple language that fifth-grade pupils can understand. Great care has been taken to avoid overexplanation and the confusion that it causes. The vocabulary has been carefully selected and contains an unusually high percentage of words recognized in authoritative word lists as suitable for the fifth grade and below.

A generous number of carefully graded abstract exercises is distributed throughout the book. These exercises are scientifically constructed to provide drill on all the basic number facts.

To assure efficient learning the pupil's progress is frequently checked by reviews, summaries, and tests. There is also a comprehensive program of diagnostic tests covering whole numbers, fractions, and decimals, with keyed references to many remedial exercises.

The authors wish to acknowledge their indebtedness to Dr. Ethel Sutherland, to Miss Margaret Uhlinger, and to Mrs. Siegried M. Upton for their many valuable contributions to this book.

CHAPTER ONE

Warming Up for the Year's Work

OUR BIG GAME ANIMALS

1. The big game animals in our country include deer, elk, moose, antelopes, bears, buffaloes, mountain goats, and bighorn sheep. In a recent year our government found that we had 6,748,424 of these animals all together in this country and that 2,144,922 of them lived in our National Forests. How many of these animals lived elsewhere?

2. The number 6,748,424 is read 6 million, 748 thousand, 424. How do you read 2,144,922?

3. There are more wild deer in this country than any other kind of big game animal. We have 3,805,368 white-tailed deer; 1,887,729 mule deer; and 396,075 black-tailed deer. How many of these three kinds of deer do we have? Read each of the numbers in this problem.

4. Moose, elk, and caribou also belong to the deer family. There are 11,840 moose, 236,787 elk, and 25 woodland caribou in our country. How many of these members of the deer family do we have?

5. What is the total number of all kinds of deer in the United States? See ex. 3 and 4.

6. In ex. 5 you found that there are 6,337,824 deer of all kinds in this country. In ex. 3 you are told that we have 3,805,368 white-tailed deer. Tom says that over half of all the deer are white-tailed deer. Is Tom right?

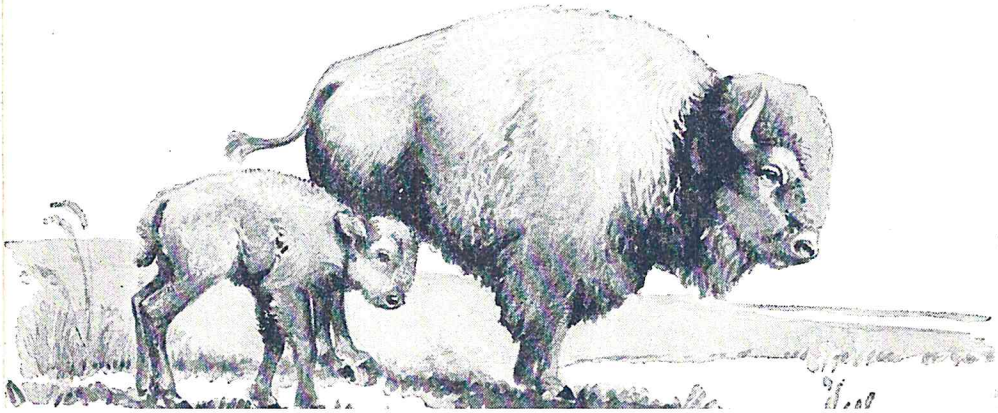
1. There are 3,805,368 white-tailed deer in this country. Of these white-tailed deer, 111,794 are in Maine; 734,200 in Michigan; 472,503 in Minnesota; 300,060 in New York, and 750,000 in Pennsylvania. Which of these 5 states has the largest number of white-tailed deer? Which state holds second place in the number of white-tailed deer? Which state holds third place? fourth place? fifth place?

2. Mary read that over half of all our white-tailed deer are in these 3 states: Pennsylvania, Michigan, Minnesota. How many white-tailed deer are there in these 3 states? See ex. 1. Find $\frac{1}{2}$ of 3,805,368. Is Mary right?

3. The other big game animals in the United States are as follows: antelopes, 199,385; bighorn sheep, 15,325; mountain goats, 16,395; peccaries, 54,120; wild boar, 1232; black and grizzly bears, 119,143; buffaloes, 5000. How many big game animals in all are there in this group?

4. The total number of big game animals in this country is made up of the 6,337,824 deer mentioned in ex. 6, page 1, and the other animals given above in ex. 3. How many big game animals have we all together?

5. In the year 1870 there were about 5,500,000 buffaloes in our country. How many years ago was 1870? Today we have only 5000 buffaloes. Fred says that in 1870 we had over 1000 times as many buffaloes as we have today. Multiply 5000 by 1000 and see if Fred is right.



1. There are about 140,000,000 people living in the United States; 140,000,000 is read 140 *million.*

2. In 1940 there were 7,455,000 people living in New York, which is the largest city in the United States; 7,455,000 is read 7 *million,* 455 *thousand.*

3. In 1940 there were 25,433,542 children attending the schools in the United States; 25,433,542 is read 25 *million,* 433 *thousand,* 542.

4. Numbers containing 7, 8, or 9 figures, like those above, stand for *millions.* In order to make it easy to read large numbers, the figures are separated by commas into groups of 3 figures each, beginning at the right. These groups are called *periods.* The names of these periods are shown below:

Millions	Thousands	Ones
135,	240,	453

This number is read 135 *million,* 240 *thousand,* 453.

5. Separate these numbers into periods by putting commas in the right places; then read each number: 2613425; 741510; 68237000; 529017204; 53218.

6. What is the largest number and the smallest number that you can write with 9 figures? with 8 figures? with 7 figures? with 6 figures? Read each of your numbers.

Write these numbers:

7. 23 million, 450 thousand, one hundred ten.

8. 106 million, 43 thousand, twenty-nine.

9. 7 million, 300 thousand, one hundred.

10. 96 million, 5 thousand, two hundred forty.

11. 536 million, 88 thousand, sixty.

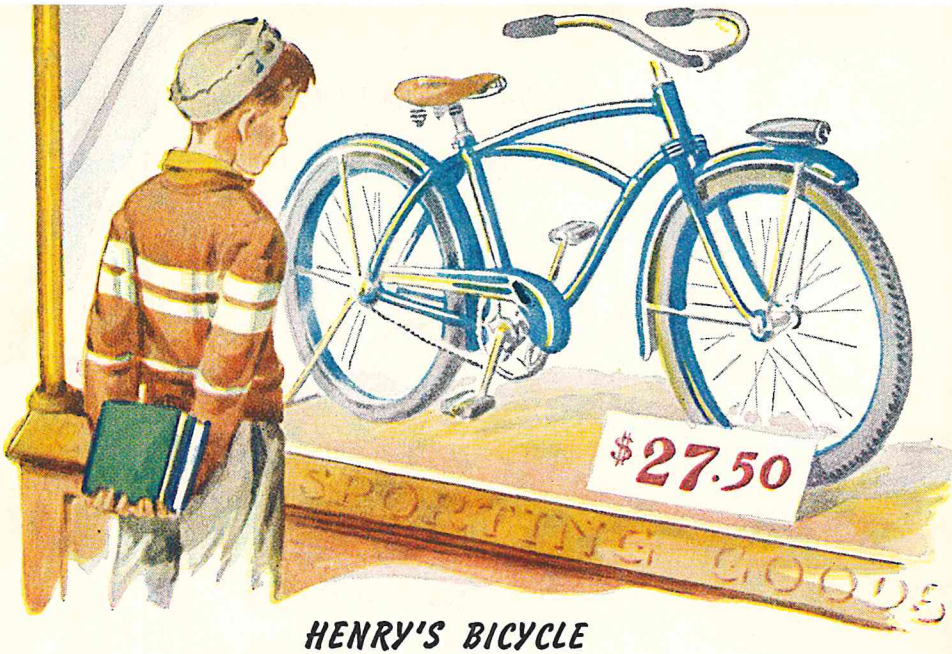
12. Bring newspaper clippings to school that contain numbers of 7 or more figures. Read these numbers.

THE 100 ADDITION FACTS

This is a test on the addition facts. You should be able to give all the sums orally within the time stated by the teacher. Make a list of any facts that give you trouble and practice on them:

1.	1	3	9	3	5	6	4	0	2	4
	4	0	4	2	8	1	4	6	5	3
	5	3	13	5	13	7	8	6	7	7
2.	2	7	6	0	5	8	2	7	1	2
	6	8	3	5	7	3	1	4	0	8
	8	15	9	5	12	11	3	11	1	10
3.	4	7	9	5	3	0	7	1	5	9
	8	1	6	4	3	2	6	9	5	0
	12	8	15	9	6	2	13	10	10	9
4.	0	2	0	9	8	9	4	9	3	6
	8	4	0	8	2	5	1	7	5	8
	8	6	0	17	10	14	5	16	8	14
5.	9	3	9	1	4	3	2	5	2	8
	1	7	9	2	6	9	7	0	3	5
	10	10	18	3	10	12	9	5	5	13
6.	5	0	6	5	8	6	5	4	8	7
	6	4	6	3	7	2	1	9	0	9
	11	4	12	8	15	8	6	13	8	16
7.	7	6	1	4	6	2	8	2	8	7
	0	9	3	2	7	9	4	0	9	3
	7	15	4	6	13	11	12	2	17	10
8.	7	0	3	7	0	8	8	9	1	6
	7	9	4	5	3	1	6	3	6	4
	14	9	7	12	3	9	14	12	7	10
9.	0	5	1	7	1	4	6	3	8	3
	1	9	7	2	1	5	0	6	8	1
	1	14	8	9	2	9	6	9	16	4
10.	1	2	0	1	4	3	9	6	4	5
	5	2	7	8	7	8	2	5	0	2
	6	4	7	9	11	11	11	11	4	7

TO THE TEACHER: See the suggestions on page 308.



HENRY'S BICYCLE

1. After school was out in June, Henry began to earn and save money for a new bicycle. He mowed Mr. Smith's lawn once each week and earned $.60 a week. How much did he earn in 12 weeks?

2. Henry sold vegetables from his garden. He sold 75 bunches of beets at $.07 a bunch and 60 bunches of carrots at $.08 a bunch. How much did he get for these vegetables?

3. When his corn was ripe Henry sold 30 doz. ears of corn at $.35 a dozen and 20 doz. ears at $.30 a dozen. How much in all did he get for the corn?

4. How much did Henry get all together from the beets, carrots, and corn?

5. Henry's expenses for his garden were $5.25. How much garden money did he have left after paying expenses?

6. How much money did Henry have from mowing the lawn and selling vegetables? See ex. 1 and 5. Did he have enough to buy a bicycle for $27.50? Could he also buy a bicycle horn for $.79?

The work below in ex. 1–9 is very important. It will help you to add long columns of figures; it will also help you to carry in multiplication.

Add 4 to each number. Do the work in your head. Give only the answers. Work as quickly as you can:

1.	25	17	34	72	85	59	91	67
2.	38	73	27	15	56	69	47	88
3.	75	89	65	36	44	18	55	24
4.	57	66	74	87	29	93	32	19
5.	16	28	46	68	33	77	86	58
6.	63	35	53	82	76	54	26	79
7.	49	95	84	23	52	13	64	37
8.	83	14	78	45	48	22	39	62

9. Add 5 to each number in ex. 1 to 8. Add 6 to each number; add 8; add 3; add 7; add 2; add 9.

10. Joe wants to go to Newton to a football game. He needs $.35 for a ticket to the game, $.50 for a round-trip bus ticket, and $.30 for his lunch. How much money does Joe need all together?

In an addition problem the numbers you add are called the *addends*. The answer is called the *sum*. What is the sum in this example? What are the addends in this example?

$ .35
.50
.30
$1.15

11. Joe has saved $.67. He can earn $.45 tomorrow and his father will give him $.25 the day of the game. How much money will Joe have then? Is this enough money to go to Newton to the game?

12. In the central school there are 131 pupils in the lower grades, 104 pupils in the upper grades, and 86 high school pupils. How many pupils are there all together?

Begin at the bottom and add up. Check by adding down:

1. $24.56	$17.68	$ 6.24	$12.42	$19.37
13.40	3.07	18.26	26.53	6.25
$37.96	$20.75	$24.50	$38.95	$25.62
2. $23.57	$22.68	$12.69	$ 6.86	$42.35
18.49	28.53	5.04	16.47	27.79
$42.53	$51.21	$17.73	$23.33	$70.14
3. $38.93	$48.94	$18.05	$27.45	$19.85
11.56	15.68	29.76	36.93	48.37
$50.49	$64.62	$47.81	$64.38	$68.22

4. 157	933	516	407	648	468	793
661	156	690	973	357	594	568
149	319	383	176	574	104	466
5. 653	542	379	714	755	453	876
598	897	840	598	489	468	657
122	379	277	186	408	633	462
437	103	641	607	434	285	351
6. 617	890	279	734	247	248	592
589	624	572	455	678	869	775
974	376	965	988	565	972	856
156	937	216	161	434	253	844
131	128	456	206	346	318	149

Copy, add, and check:

7. 94 + 22 + 73 + 37
8. 18 + 14 + 39 + 57
9. 56 + 69 + 43 + 77
10. 87 + 69 + 31 + 45
11. 58 + 99 + 41 + 52
12. 48 + 59 + 60 + 62
13. 53 + 67 + 18 + 59
14. 36 + 44 + 82 + 65
15. 54 + 78 + 41 + 32
16. 95 + 80 + 33 + 69
17. 18 + 72 + 23 + 63
18. 26 + 75 + 54 + 83

NOTE TO TEACHER: To save the necessity of copying ex. 1 to 6 before adding the numbers, the answers may be written on folded paper as described on page 308. This plan may be used for subsequent exercises in addition and subtraction at the teacher's discretion.

Alice goes to junior high school. At noon she makes change in the lunchroom. When Alice makes change, she uses as few coins as possible. For example, if Tom gives her a quarter to pay for a 14-cent lunch, she gives Tom 1 cent and 1 dime in change, which is 2 coins; she does not give him 1 cent and 2 nickels unless she is out of dimes.

1. Fred's lunch cost 18¢. He gave Alice a quarter. When Alice gave Fred the change she said "18." Then she handed him 2¢ and said "19, 20"; then she gave him a nickel and said "25." Sometimes Alice says "18, 20, 25."

2. Betty gave Alice a half dollar to pay for her 20-cent lunch. Tell how Alice made the change and what she said as she gave it to Betty. How many coins did Betty get?

3. Tell another way Alice could have made the change for Betty by giving her more coins than in ex. 2.

4. George gave Alice $1.00 to pay for his lunch and Tom's. One lunch cost $.25 and the other cost $.27. Count the change as Alice did when she gave it to George.

5. Margaret's lunch cost 30¢. She gave Alice $1.00. Alice gave Margaret 2 nickels, 1 dime, and 2 quarters. Was that the right change? Count the change as Alice did.

6. John bought soup for 8¢, a sandwich for 10¢, milk for 6¢, and an apple for 5¢. If he gave Alice 50¢, how much change did he get?

7. Joe's lunch cost 23¢. He gave Alice a half dollar. Show how Alice could make the change by giving Joe 3 coins. Also show how she could make the change by giving him 5 coins; by giving him 6 coins; by giving him 7 coins. Which is the best way and why?

8. Peter's lunch cost 17¢. He gave Alice a quarter and 2 pennies. Alice gave him a dime in change. Was that right? Why did Peter give Alice a quarter and 2 pennies instead of giving her only a quarter?

9. One day Mary's lunch came to 46¢. She gave Alice a half dollar. Alice said, "I am short of pennies. Can you give me another cent?" Mary had a cent and gave it to Alice. What coin did Alice give Mary in change?

10. Start with 13¢ and add these coins to it: 2 pennies, 1 dime, 1 quarter, 1 half dollar. What is the sum?

11. To have enough coins to make change Alice went to the bank and got $5.00 changed into coins. She asked for two dollars' worth of dimes, one dollar's worth of nickels, and two dollars' worth of quarters. How many coins of each kind did she get?

THE 100 SUBTRACTION FACTS

This is a test on the subtraction facts. You should be able to give all the answers orally within the time stated by the teacher. Make a list of any facts that give you trouble and practice on them:

1.	3	1	8	11	15	12	10	9	6	2
	2	1	4	3	7	8	7	7	6	0
	1	0	4	8	8	4	3	2	0	2
2.	5	8	7	10	13	14	12	8	7	4
	4	2	3	2	7	9	3	6	2	1
	1	6	4	8	6	5	9	2	5	3
3.	1	7	6	16	10	11	15	9	4	2
	0	7	5	9	8	2	8	8	0	2
	1	0	1	7	2	9	7	1	4	0
4.	5	3	7	11	14	12	17	7	9	4
	3	1	6	9	5	7	9	5	9	2
	2	2	1	2	9	5	8	2	0	2
5.	3	8	6	12	14	10	16	9	5	0
	3	5	4	9	8	3	8	4	1	0
	0	3	2	3	6	7	8	5	4	0
6.	5	8	9	15	10	13	11	13	4	9
	0	1	6	9	9	6	4	8	3	1
	5	7	3	6	1	7	7	5	1	8
7.	2	7	9	17	10	12	11	14	9	8
	1	0	5	8	5	6	8	7	3	8
	1	7	4	9	5	6	3	7	6	0
8.	6	5	8	13	18	11	16	10	8	5
	2	5	7	5	9	5	7	1	0	2
	4	0	1	8	9	6	9	9	8	3
9.	3	9	7	10	12	11	14	13	4	6
	0	2	4	4	4	7	6	9	4	1
	3	7	3	6	8	4	8	4	0	5
10.	7	6	8	11	15	13	10	12	6	9
	1	0	3	6	6	4	6	5	3	0
	6	6	5	5	9	9	4	7	3	9

To THE TEACHER: See the suggestions on page 308.

A PICNIC AT GREEN LAKE

1. The first Saturday after school opened this fall our class had a picnic at Green Lake. There were 16 girls, 14 boys, 2 teachers, and 3 mothers at the picnic. How many persons were there?

2. We met at the school at 9:30 A.M. 10 children and 1 teacher went to the lake on bicycles. The rest went by bus. How many went to the picnic by bus?

3. Those who went by bicycle left at 9:40 and arrived at Green Lake at 10:20. Those who went by bus left at 9:50 and arrived at the lake at 10:12. How long did it take each group? How many minutes longer did it take by bicycle than by bus?

4. Before lunch the boys had a relay race. There were four boys on each team. The Blue team made these times: 7 sec., 8 sec., 7 sec., 7 sec. The Red team made these times: 8 sec., 7 sec., 7 sec., 8 sec. Find the total number of seconds for each team. Which team made the shorter time? Which team won?

5. The 35 persons that went to the picnic paid $.25 each. Was this enough to pay the expenses of $8.69?

1. This year there are 4520 books in the school library. There were 3895 books in it last year. How many books are new this year?

Subtract 3895 from 4520. The answer is 625. There are 625 new books in the library this year. To check the work, add up as follows: Think "5 + 5 = 10; 1 (carried) + 2 + 9 = 12; 1 (carried) + 6 + 8 = 15; 1 (carried) + 3 = 4."

$$\begin{array}{r} 4520 \\ 3895 \\ \hline 625 \end{array}$$

In this problem 4520 is the *minuend*, 3895 is the *subtrahend*, and 625 is the *remainder* or *difference*.

Subtract these numbers. Do the work in your head:

2. 38 − 30	16 − 11	40 − 6	20 − 12
3. 29 − 15	24 − 15	52 − 8	35 − 25
4. 32 − 28	41 − 39	33 − 7	27 − 19

Subtract. Check the work by adding:

5.	48	380	168	205	236	6295
	26	240	73	101	221	4184
6.	37	150	483	739	660	9734
	19	66	258	256	257	8639
7.	52	184	424	890	550	5664
	9	176	183	165	250	2817
8.	69	205	715	741	387	2065
	61	194	715	381	172	1508

9. From 325 subtract 175. Subtract 235 from 420.
10. From 680 subtract 150. Subtract 653 from 851.
11. From 222 subtract 157. Subtract 444 from 562.
12. From 937 subtract 429. Subtract 300 from 484.

Work these problems. Which are subtraction problems?

1. Jack bought a pair of shoes for $3.45. How much change did he get from $5.00?

2. Bill paid $4.20 for a pair of shoes. How much more did Bill pay for his shoes than Jack paid? See ex. 1.

3. John had $1.50 to spend when he went to the city. He had $.28 left when he came home. How much money did John spend?

4. Grace weighs 75 pounds. Alice weighs 9 pounds less. How many pounds does Alice weigh?

5. Last week Mary saw a dress that she liked for $5.50. Today she saw the same dress for $4.59. How much cheaper is the dress today than last week?

6. Betty's roller skates cost $1.69. Ann's roller skates cost $1.45. What is the difference in the prices of the two pairs of skates?

7. Last year there were 652 pupils in our school. Miss Brown says there are 65 more pupils this year than last year. How many pupils are there in our school this year?

8. Helen weighs 86 pounds. She is 12 lb. overweight. How many pounds should Helen weigh?

9. Kate weighed 56 pounds in June. Now she weighs 65 pounds. How many pounds has she gained?

10. There are 35 children in our class now. All but 6 of them gained weight during the summer. How many children gained weight?

11. During the last 4 weeks Dick earned these amounts of money: $1.16, $.75, $.80, $.92. How much money did Dick earn all together?

12. Henry has orders for 120 eggs each week. So far this week he has gathered 96 eggs. How many more eggs does he need this week to fill his orders?

If you get all the examples right in Set I, you need not do the other sets. If you need practice, do Sets II and III.

Subtract these numbers. Check the work by adding:

Set I

1. 4688	2000	9236	$73.94	$68.00
4125	1808	3349	23.59	43.75
2. 7471	8112	7136	$50.00	$62.33
5489	1079	3225	36.00	14.79
3. 2000	9345	7003	$10.50	$30.07
1177	8368	4009	2.77	14.28

Set II

4. 7134	8746	5213	$20.20	$82.13
1237	3888	4326	11.74	74.38
5. 5492	6912	7000	$87.62	$40.05
3173	4666	3868	47.63	14.37
6. 8000	6975	7277	$26.00	$60.00
2737	2532	1735	12.05	42.19

Set III

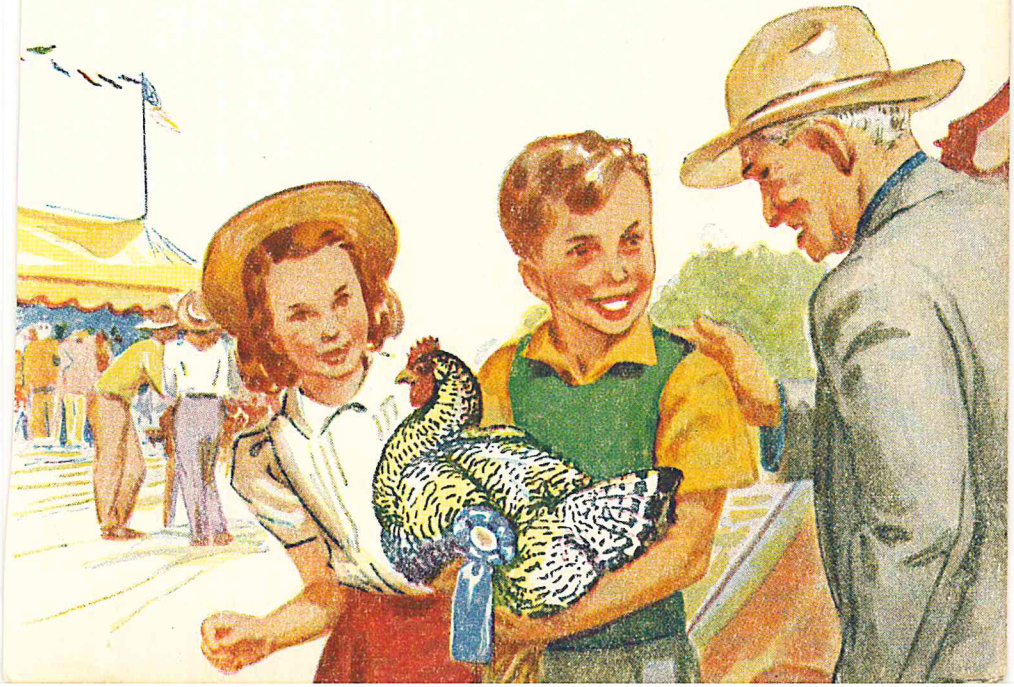
7. 5184	7434	4000	$95.52	$50.02
3632	6548	2626	36.88	11.75
8. 1000	3500	9535	$85.59	$82.15
436	882	1156	65.13	18.76
9. 1040	7314	8166	$10.00	$66.78
276	6656	6477	4.74	65.09

1. In September the boys and girls in Hilton often win prizes at the county fair. This year Henry got a prize of $5.00 for showing his Plymouth Rock hen, $2.00 for a pumpkin he grew, and $1.50 for making the best model airplane. How much money in prizes did Henry get?

2. Henry's sister Mary made cookies and won a prize of $1.00. She also knit a sweater which was judged the best hand-knit sweater. She received a prize of $3.00 for showing the sweater. How much did Mary get in prizes?

3. Other boys and girls in Hilton won prizes at the fair. The prize money won by the boys in the Central School amounted to $73.50. The girls won $57.25. How much did they win all together?

4. The attendance at the fair for each day of the week was: Monday, 11,275; Tuesday, 10,502; Wednesday, 16,338; Thursday, 14,782; Friday, 16,807; Saturday, 21,654. Find the total attendance for the week.



1. The square at the right is a magic square. Each column, each row, and each diagonal line has the same sum. For example, 12 + 7 + 14 + 1 = 34, 6+9+4+15=34, 1+15+10+8=34, 12 + 9 + 5 + 8 = 34. There are 10 sums in all that equal 34, each sum being obtained by adding four numbers. Find the numbers that make up each of the other six sums. Does each sum equal 34?

1	15	10	8
14	4	5	11
7	9	16	2
12	6	3	13

In each square below add to see if you can get 10 sums alike. If you can, it is a magic square:

2

11	24	17	22
25	14	19	16
20	15	26	13
18	21	12	23

3

27	22	15	18
16	17	28	21
26	23	14	19
13	20	25	24

4

33	43	57	51
55	53	31	45
35	41	59	49
61	47	37	39

Put the missing numbers in each square below so that it will be a magic square. Each column, each row, and each diagonal must have the same sum. In ex. 5, you see that the sum of the numbers in the first column is 118. Find the missing number that will make the first row equal 118. Then find the other missing numbers. Be sure to test your final square:

5

22	36	35	
33		28	30
29	31		26
34	24	23	

6

	49	50	
52			55
56	54	53	59
51	61		48

7

47		60	50
58	52	53	
	56		51
59	49	48	

1. The 100 multiplication facts are like the 100 addition facts on page 4 except that you multiply the numbers instead of adding them. Turn to page 4 and try to *multiply* all the numbers on that page orally within the time stated by the teacher. Give the answers only.

When you take the test on the multiplication facts, the teacher will check your answers as you give them orally. She will also make a list of the facts for which you give wrong answers as well as those upon which you hesitate. At the end of the test, the teacher will give you the list of these facts. Practice until you have memorized these facts.

2. If you forget the answer to a multiplication fact, you can find it in the table on the inside of the back cover; a better way to get the answer is to figure it out in your head as shown on pages 18 to 21. Be sure, however, to memorize the facts on which you are weak as soon as possible; then you will not need to use these helps.

3. The multiplication facts go together in pairs like shoes. For example, 6×9 and 9×6 make a pair of facts. The numbers in 6×9 are just like those in 9×6 but they are turned around. *Both facts in a pair have the same answer.* If you forget the answer to 9×6, turn the numbers around and try 6×9. If you remember that $6 \times 9 = 54$, this tells you that $9 \times 6 = 54$.

$$\begin{array}{r} 6 \\ 9 \\ \hline 54 \end{array} \qquad \begin{array}{r} 9 \\ 6 \\ \hline 54 \end{array}$$

4. Suppose you forget the answers to the following facts. Turn the numbers around and then try to multiply them:

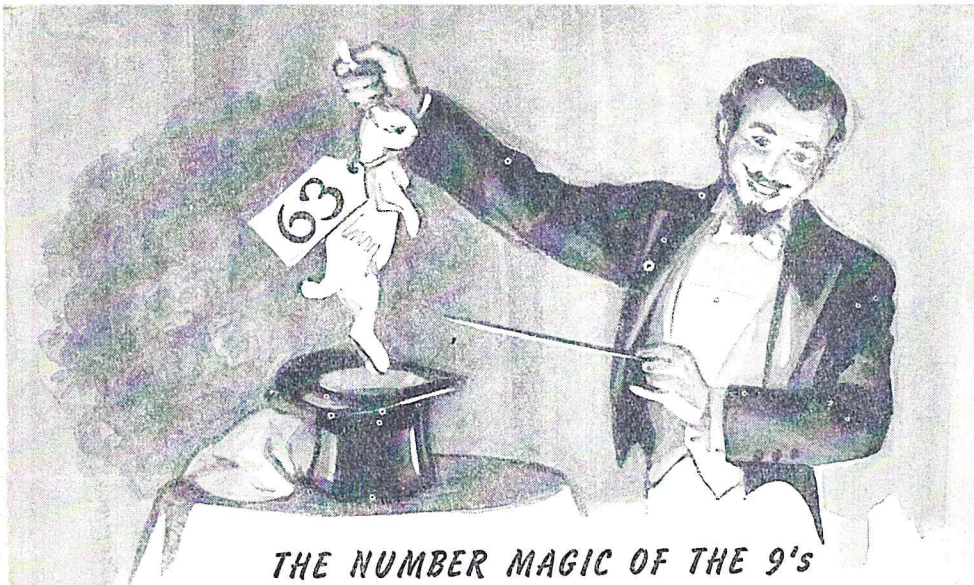
7×4 $\quad 8 \times 6$ $\quad 7 \times 9$ $\quad 8 \times 7$ $\quad 8 \times 3$ $\quad 5 \times 8$

5. Whenever a multiplication fact contains a 0, like 7×0 or 0×8, the answer is always 0. Give the answers to each of these facts:

$$\begin{array}{r} 0 \\ 7 \\ \hline 0 \end{array} \qquad \begin{array}{r} 7 \\ 0 \\ \hline 0 \end{array}$$

0×3 $\quad 9 \times 0$ $\quad 0 \times 5$ $\quad 6 \times 0$ $\quad 0 \times 0$

To THE TEACHER: See the suggestions on page 308.



THE NUMBER MAGIC OF THE 9's

1. You will learn some interesting tricks in number magic by studying the 9's facts in multiplication. The answers to these facts are shown in Column *A*. The first answer is 18; if you add 1 and 8, the sum is 9. The next answer is 27; if you add 2 and 7, the sum is 9. The next answer is 36; you see that $3 + 6 = 9$. Add the figures in each of the other answers. Is the sum always 9?

	A
$2 \times 9 =$	18
$3 \times 9 =$	27
$4 \times 9 =$	36
$5 \times 9 =$	45
$6 \times 9 =$	54
$7 \times 9 =$	63
$8 \times 9 =$	72
$9 \times 9 =$	81

2. In the table you find that the answer for 8×9 is 72. If you cover up the 2 of 72, so that you see only the 7, you know that the figure covered up must be 2 because 7 and 2 make 9. Without looking at the table, tell the second figure of the answer, if the first figure is 5. Think "5 and what make 9?"

3. What is the second figure of the answer if the first figure is 8? if the first figure is 4? if the first figure is 3? if the first figure is 6?

If you know only the first figure of an answer in the 9's table, you can get the second figure by adding enough to the first figure to make 9.

4. Here is some more of the magic in the table of 9's. Start with $3 \times 9 = 27$. In this fact 9 is multiplied by 3; notice that the first figure of the answer is 2, which is 1 less than 3.

5. Study $4 \times 9 = 36$. Here 9 is multiplied by 4; the first figure of the answer is 3, which is 1 less than 4.

6. Study all the other facts in the table in ex. 1. Is the first figure of the answer always 1 less than the number by which 9 is multiplied? What is the first figure of the answer for 8×9? for 4×9? for 5×9? for 9×9? for 7×9?

In the 9's table, the first figure of each answer is 1 less than the number by which 9 is multiplied.

7. You are now ready to do a magic trick. Suppose you forget the answer to 7×9. The first figure of the answer must be 1 less than 7, which is 6. To get the second figure of the answer, add enough to 6 to make 9. Since 6 and 3 make 9, the answer is 63. So $7 \times 9 = 63$.

8. Suppose you forget the answer to 8×9. Think "1 less than 8 is 7. 7 and 2 are 9, so the answer is 72. $8 \times 9 = 72$."

9. Use the magic trick to find the answer to 6×9; to 5×9; to 3×9; to 7×9; to 4×9.

10. The magic trick will also give you the answers to facts like these: 9×7, 9×5, 9×3, 9×6, 9×8, 9×4. Find the answers.

IF YOU FORGET THE 4's FACTS

1. You know that 4 is twice as much as 2, so 4 fives (4×5) is twice as much as 2 fives (2×5). This is true because $4 \times 5 = 20$ while $2 \times 5 = 10$. 20 is twice as much as 10.

2. You also see that 4×6, which equals 24, is twice as much as 2×6, which equals 12. *When you multiply by 4 the answer is twice as large as when you multiply by 2.*

3. If you forget the answer to 4×7, take $\frac{1}{2}$ of 4, which is 2. Then find the answer for 2×7 and double it. Think "$2 \times 7 = 14$, $2 \times 14 = 28$. So $4 \times 7 = 28$." When you double a number, you multiply it by 2.

4. If you forget 4×6, try 2×6 and double the answer. Think "$2 \times 6 = 12$, $2 \times 12 = 24$. So $4 \times 6 = 24$."

5. You can use this same plan when 4 is the second number. If you forget 7×4, take $\frac{1}{2}$ of 4, which is 2. Then find 7×2 and double the answer. Think "$7 \times 2 = 14$, $2 \times 14 = 28$. So $7 \times 4 = 28$."

6. Double these numbers. Do the work in your head:

14	12	16	10	18	15	21	24

Suppose you forget these facts. Find the answers as shown above. Do all the work in your head:

7. 4×5	4×4	6×4	9×4
8. 4×8	4×6	5×4	3×4
9. 4×9	4×7	7×4	8×4

If you cannot multiply by 4, multiply by $\frac{1}{2}$ of 4, which is 2. Then double the answer.

To the Teacher: The helps given on pages 20 and 21 assume that the pupil has mastered the multiplication facts for the 2's, 3's, and 5's. If a pupil forgets a fact involving the 4's, 6's, 7's, or 8's, it can be found mentally as shown on pages 20 and 21. The only fact not covered is 7×7. The 9's facts are provided for on pages 18 and 19.

1. You know that 6 is twice as much as 3, so 6×5 is twice as much as 3×5. This is true because $6 \times 5 = 30$ and $3 \times 5 = 15$. 30 is twice as much as 15.

2. If you forget the answer to 6×7, take $\frac{1}{2}$ of 6, which is 3. Then find the answer to 3×7 and double it. Think "$3 \times 7 = 21$, $2 \times 21 = 42$. So $6 \times 7 = 42$."

3. If you forget the answer to 9×6, take $\frac{1}{2}$ of 6, which is 3. Then find the answer to 9×3 and double it. Think "$9 \times 3 = 27$, $2 \times 27 = 54$. So $9 \times 6 = 54$."

4. Double these numbers. Do the work in your head:

24	27	28	32	36	21	20	18

Suppose you forget the answers to these facts. Find the answers as shown in ex. 1 to 3. Do the work in your head:

5.	6×4	6×8	7×6	5×6
6.	6×9	6×5	6×6	8×6

7. The plan above can be used to multiply by 8. If you forget 8×7, take $\frac{1}{2}$ of 8, which is 4. Then find 4×7 and double the answer. Think "$4 \times 7 = 28$, $2 \times 28 = 56$. So $8 \times 7 = 56$." To find 8×6, take $\frac{1}{2}$ of 8, which is 4; then try 4×6 and double it. Or take $\frac{1}{2}$ of 6, which is 3; then find 8×3 and double it. Both give the same answer.

Show how to get the answers by the plan used above:

8.	8×5	8×8	8×6	9×8
9.	8×9	7×8	5×8	6×8

If you cannot multiply by 6, multiply by $\frac{1}{2}$ of 6, which is 3. Then double the answer.
If you cannot multiply by 8, multiply by $\frac{1}{2}$ of 8, which is 4. Then double the answer.

1. Bob takes music lessons. Last year he took 43 lessons. Each lesson cost $1.75. How much did his lessons cost last year?

You do the work as shown at the right. When you multiply 175 by 3, be sure to place 525 so that its right-hand 5 comes under the 3 by which you multiply. Also place the right-hand 0 of 700 under the 4 by which you multiply. Check the work by going over it.

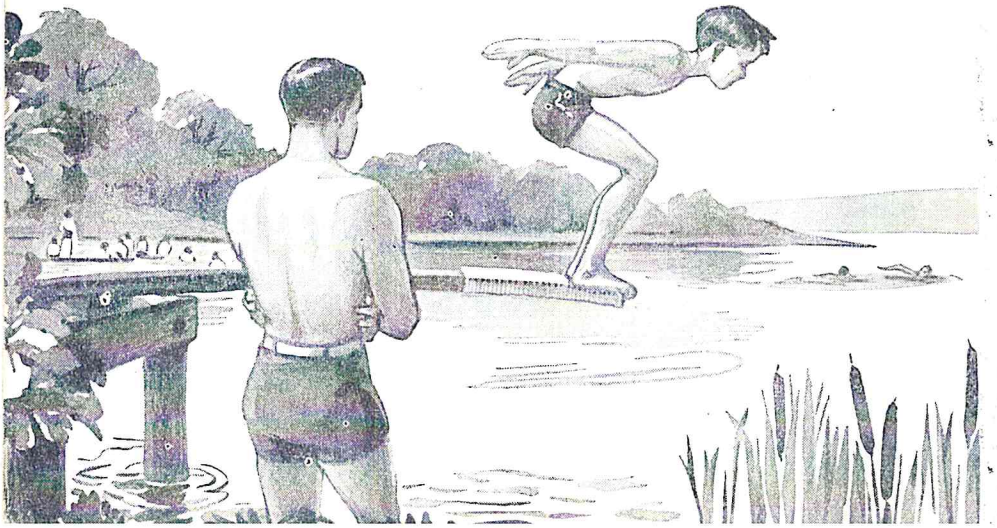
```
  $1.75
     43
  -----
    5 25
   70 0
  -----
  $75.25
```

In this example $1.75 is the *multiplicand;* 43 is the *multiplier;* 525 and 700 are the *partial products.* The answer, $75.25, is called the *product.*

2. One of the high school girls gives violin lessons at $.75 a lesson. Alice took 18 lessons from her. How much did Alice pay for the lessons?

3. Joe likes to draw. He took 15 drawing lessons which cost $1.50 each. How much did Joe's lessons cost?

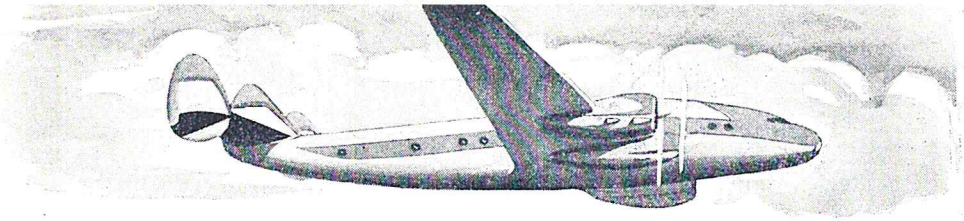
4. Last summer while Fred was at camp he took 12 lessons in diving. These lessons cost $1.25 each. How much did these lessons cost in all?



Multiply. Check the work by going over it:

1.	78	57	19	305	$.68	$2.15
	43	28	26	61	25	39
2.	36	70	95	294	$.84	$3.07
	28	59	37	45	76	17
3.	98	46	69	318	$.76	$1.65
	48	83	71	49	62	54
4.	56	96	52	470	$.58	$3.42
	85	92	38	76	27	29
5.	35	91	70	216	$.38	$6.91
	69	48	35	37	63	63

6.	70	92	38	509	$.48	$1.84
	98	26	74	59	28	15
7.	83	54	72	632	$.73	$3.04
	73	92	46	15	78	83
8.	27	78	36	421	$.93	$1.34
	92	65	84	68	19	35
9.	85	18	25	764	$.65	$2.65
	18	39	57	92	16	46
10.	94	69	57	608	$.47	$2.19
	47	23	34	49	35	68
11.	37	96	71	210	$.85	$4.18
	25	33	49	58	46	19



BY AIR TO WASHINGTON

1. Mr. Allen goes to Washington, D. C., by airplane once a month. A round-trip ticket costs $25.68. How much does it cost Mr. Allen a year to travel by air to Washington?

Do the work as shown at the right. Be careful to write the partial products, 5136 and 2568, in the correct positions. Put a decimal point before the last two figures in the answer to separate the dollars from the cents. How much does Mr. Allen pay a year for airplane tickets to Washington?

```
$  25.68
      12
  51 36
 256 8
$308.16
```

Multiply. Check the work by going over it:

2.	3426 48	1609 59	2538 62	$17.25 17	$25.30 35
3.	2085 93	6140 36	4781 85	$34.79 31	$15.67 24
4.	5137 76	8259 38	7068 43	$21.36 27	$40.79 59
5.	2089 47	3490 16	2856 58	$24.79 82	$40.56 37
6.	6197 16	2519 94	4908 27	$15.34 74	$36.78 49
7.	3097 53	3917 28	2846 56	$43.20 29	$13.98 47

Multiplying a four-figure number by a two-figure number.

1. You have learned that you can multiply a number by 10 by writing a zero after it. For example, $10 \times 6 = 60$ and $10 \times 17 = 170$. Multiply these numbers by 10: 8, 5, 7, 3, 4, 9, 11, 19, 63, 27.

2. In the same way you can multiply a number by 100, by writing 2 zeros after it. For example $100 \times 5 = 500$ and $100 \times 13 = 1300$. Multiply these numbers by 100: 8, 6, 4, 9, 7, 2, 14, 27, 36.

> To multiply a number by 10, write 0 after it.
> To multiply a number by 100, write 00 after it.

3. You know that 40 is the same as 4×10. To multiply a number by 40, first multiply it by 4 and then write 0 after the result. For example, to multiply 12 by 40, first multiply 12 by 4 which gives 48; then write 0 after 48 which gives 480. Multiply 11 by 60; 14 by 20; 13 by 30; 22 by 40; 18 by 20; 12 by 60.

4. In the same way 500 is the same as 5×100. To multiply a number by 500, first multiply it by 5 and then write 00 after the result. For example, to multiply 15 by 500, multiply 15 by 5 which gives 75; then write 00 after 75 which gives 7500. Multiply 12 by 400; 23 by 300.

5. When you multiply by numbers like 40 and 500, arrange written work as shown below, letting the zeros of the multiplier stand out at the right.

15	74	81	36	27
30	80	70	400	600
450	5920	5670	14400	16200

Multiply. Arrange the work as shown in ex. 5:

6. 50×38 $\quad 20 \times 84$ $\quad 700 \times 21$ $\quad 500 \times 73$

7. 20×47 $\quad 60 \times 65$ $\quad 300 \times 54$ $\quad 400 \times 40$

THE FRUIT MAN

Joe, the fruit man, has his cart at the corner on every pleasant day. He sells fruit to the people as they pass.

1. Joe bought a box of 176 oranges. He sold them at 5¢ each. How much money did he get?

To get the answer you should find 176 × 5¢. But it is easier to find 5 × 176 and remember the answer stands for cents. You can do this because 176 × 5 has the same answer as 5 × 176 just as 8 × 5 has the same answer as 5 × 8. The work is shown at the right. The 880 stands for cents, so the answer is 880¢ which can be changed to $8.80. Joe got $8.80 for the oranges.

$$\begin{array}{r} 176 \\ 5 \\ \hline 880 \end{array}$$

2. Joe also bought a box of 88 large apples. He sold each one for 7¢. How much did he get for them?

3. How much money did Joe get for 110 large pears if he sold them at 8¢ each?

4. Joe sold 200 small oranges at 4¢ each. How much did he get for these oranges?

Find how much Joe got for this fruit:

5. 260 lemons at 3¢ each
6. 150 oranges at 6¢ each
7. 125 apples at 4¢ each
8. 135 pears at 6¢ each
9. 342 plums at 2¢ each
10. 150 peaches at 5¢ each

Interchanging multiplier and multiplicand.

Add 6 orally to each number. Then do ex. 1 to 4 again, adding 8 to each number. Repeat, adding 5, 9, 7, in turn to each number:

1.	34	67	85	19	56	48	23	72
2.	87	12	59	36	64	25	78	43
3.	49	75	63	82	17	37	54	28
4.	68	52	15	27	44	73	39	86

Begin at the bottom and add up. Check by adding down:

5.	35	64	41	23	62	40	19	35
	76	43	79	37	38	26	23	88
	84	98	57	56	93	55	52	29
	43	67	98	70	85	72	97	35
	28	46	63	14	40	99	68	90
	59	25	32	68	59	67	46	43

6.	21	57	54	83	35	27	55	66
	58	20	38	44	87	87	70	85
	79	64	97	96	69	45	58	63
	82	98	69	56	90	88	67	44
	15	51	10	32	11	73	29	18
	37	15	16	78	12	14	32	68

7.	$68.42	$36.74	$47.82	$38.58	$49.98
	47.69	98.68	35.69	14.29	7.65
	82.68	62.57	30.39	63.33	42.74

8.	$95.62	$31.44	$56.75	$57.59	$70.37
	33.37	45.91	17.90	21.13	3.23
	64.09	80.21	20.45	8.68	94.89

9.	$16.70	$16.59	$14.88	$15.26	$18.37
	5.84	14.49	7.47	38.58	7.23
	3.47	21.21	23.11	11.32	16.19
	11.06	12.35	10.56	2.34	10.69

1. Fred earned $2.00 last week. He paid $.50 for school supplies and kept $1.25 toward a football suit. How much did Fred have left to spend?

2. Fred has saved $3.75 toward the football suit that costs $6.49. How much more does Fred need to save?

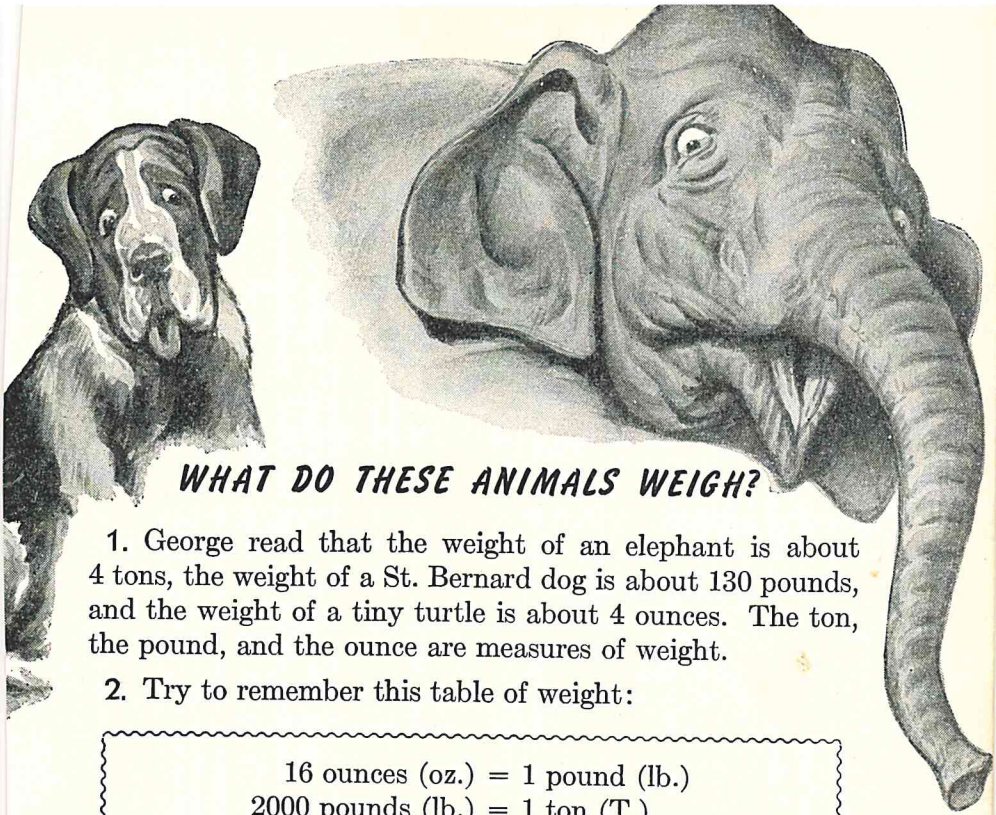
3. The 348 pupils in our school are to have a trip to the airport. By the end of last week 195 pupils had been to the airport. How many still have to make the trip?

4. Tom wanted to know how much money he made by having a garden last summer. He found that he had received $32.76 from all the vegetables he sold. His expenses for the garden were $10.50. How much money did he make?

5. At a sale Ann's mother bought Ann a winter coat for $19.98. Before the sale the coat cost $22.50. How much did Ann's mother save by buying the coat at a sale?

Subtract these numbers. Check the work:

6.	$14.87 5.32	$81.71 43.48	$40.00 17.46	$53.17 18.68	$80.04 62.68
7.	$60.05 30.99	$36.77 23.14	$12.22 5.64	$42.32 28.42	$49.29 13.81
8.	$25.96 14.69	$70.10 68.36	$14.99 7.95	$15.56 5.77	$63.37 14.79
9.	$35.26 26.48	$18.53 9.47	$18.14 15.49	$12.37 2.63	$81.41 15.59
10.	$11.84 2.84	$55.96 28.17	$60.06 46.39	$65.89 61.13	$10.00 1.84
11.	$28.48 28.39	$80.00 32.41	$14.14 7.29	$53.79 37.66	$12.50 5.50

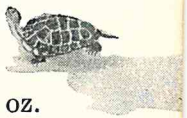


WHAT DO THESE ANIMALS WEIGH?

1. George read that the weight of an elephant is about 4 tons, the weight of a St. Bernard dog is about 130 pounds, and the weight of a tiny turtle is about 4 ounces. The ton, the pound, and the ounce are measures of weight.

2. Try to remember this table of weight:

16 ounces (oz.) = 1 pound (lb.)
2000 pounds (lb.) = 1 ton (T.)



Tell the number that should be put in each space:

3. 2 T. = . . lb. 2 lb. = . . oz. 18 oz. = . . lb. . . oz.

4. $\frac{1}{2}$ T. = . . lb. $\frac{1}{8}$ lb. = . . oz. 25 oz. = . . lb. . . oz.

5. Name 3 things that are measured by the ounce, 3 things measured by the pound, and 3 things measured by the ton.

6. On a can of corn Ann read "Net Weight, 12 oz." This means that the corn alone weighs 12 oz. not including the weight of the can. Is 12 oz. more or less than a pound?

7. Look at cans of fruit and packages of food to find the net weight marked on each package.

To the Teacher: Caution pupils never to write in their books to fill in blank spaces.

Use the numbers 36 and 6 in answering each question below:

1. What is the sum of these numbers?
2. What is the product of these numbers?
3. What is the difference between these numbers?
4. How much is half of each of these numbers?
5. How much is one third of each of these numbers?
6. How much more is the larger number than the smaller number?
7. If you subtract these numbers, what is the remainder?
8. If you add the two numbers, is the answer larger or smaller than either of the numbers?
9. If you take the smaller number from the larger one, how much is left?
10. If you divide the larger number by the smaller one, what is the result?

MIXED PRACTICE

Find the answers:

11.	$\frac{1}{3}$ of 129	$235 - 89$	56×269
12.	25×38	$453 \div 7$	$500 - 368$
13.	$94 + 77$	$8 + 9 + 4$	$1557 \div 9$
14.	$\frac{1}{5}$ of 325	17×2153	$38 + 71 + 8$
15.	$912 \div 4$	$1800 - 76$	$\frac{1}{8}$ of 304

16. How much less is 2563 than 3000?
17. How many ounces are there in 2 lb. 8 oz.?
18. How many inches are there in 3 ft. 8 in.?
19. How many minutes are there in 2 hr. 45 min.?
20. What number comes next after 9999? after 1209?

1. Jack had 40 tickets to sell for the ball game. He sold 18 tickets yesterday and 12 tickets today. How many tickets has Jack left to sell?

To solve this two-step problem you have to answer two questions. The first question, called the *hidden question,* is: "How many tickets in all did Jack sell yesterday and today?" The answer is 30 tickets. The second question is: "How many tickets has he left to sell?" The answer is 10 tickets. The hidden question is *not asked in the problem* but you have to find it and answer it before you can answer the second question. The second question is the *question asked in the problem.*

2. Tom keeps hens. He got 20 eggs yesterday and 17 eggs today. He sold 30 eggs. How many eggs has he left?

3. Alice bought 2 doz. eggs at 45¢ a dozen and a can of peaches for 28¢. How much did she pay for these things?

4. Mother made 4 doz. cookies on Saturday. There are only 10 cookies left. How many cookies have been eaten?

5. Jane's mother paid $2.50 for cloth for a dress, $.50 for a dress pattern, and $.10 for thread. How much did she have left from $5.00?

6. Mrs. White usually pays $1.00 for a dozen cakes of soap. On Saturday the same kind of soap sold for $.85 a dozen. How much did Mrs. White save by buying 2 doz. cakes of soap on Saturday?

7. Helen bought a box of crackers for 19¢, a quart of milk for 15¢, and a head of lettuce for 10¢. How much change did she get from 50¢?

8. Mary wants a book that costs $1.15. She has saved $.65. Today she earned $.25. How much more money does Mary need to buy the book?

9. Dick is collecting old newspapers. He wants to collect 50 lb. this month. Last week he collected 20 lb. This week he collected 16 lb. How many pounds must he still collect?

ORAL PRACTICE

1. Say the answers to the 100 addition facts on page 4.

2. Say the next four numbers above 999,998.

3. How many cents are there in 2 quarters, 1 dime, 2 nickels, and 4 pennies?

4. How many ounces of candy are there in 2 lb.?

5. Multiply each number by 10: 25, 31, 58, 84, 90.

6. Multiply each number by 100: 4, 11, 19, 26, 40.

7. Count the change you get from 50¢ if you buy a bottle of ink for 15¢. Count the change from $1.00 if you buy a pad for 8¢.

8. Find the sum of 6, 8, 2, 9, 5, and 8.

9. Multiply each number by 7 and add 6 to the product:
   3 8 1 4 5 6 9 7 0

10. Multiply each number by 9 and add 7 to the product:
    4 0 2 6 9 8 3 7 5

11. Add 4 to each number. Add 6; add 8; add 9:
    18 34 26 53 85 47 69 76

12. 7 dimes, 4 nickels, and 3 pennies = . . . ¢.

13. 1 half dollar, 3 dimes, and 3 nickels = . . . ¢.

14. 3 quarters, 1 dime, 1 nickel, 1 cent = . . . ¢.

15. 3 dimes, 8 nickels, and 15 pennies = . . . ¢.

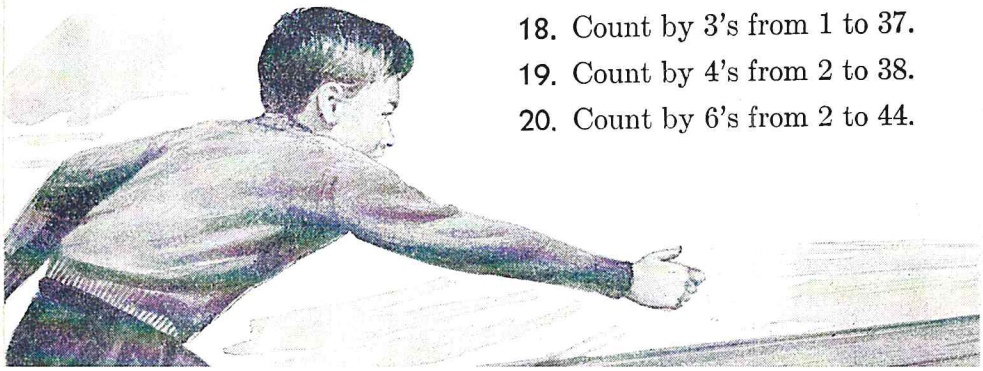
16. 1 quarter, 2 dimes, 4 nickels, and 7 pennies = . . . ¢.

17. Count by 2's from 7 to 35.

18. Count by 3's from 1 to 37.

19. Count by 4's from 2 to 38.

20. Count by 6's from 2 to 44.



1. Peter sold 30 tickets to the school basketball game. He got $.25 for each ticket. How much money in all did Peter get for the tickets?

2. Jack and Henry have stamp books. Jack has 325 stamps in his book and Henry has 600 stamps in his. How many more stamps has Henry than Jack?

3. Sally wants to buy some school supplies. She needs a 10-cent pad, a 7-cent pencil, a 3-cent eraser, and a 15-cent bottle of ink. How much money must she bring?

4. Alice bought a bunch of grapes weighing 23 oz. How much more or less than a pound did the grapes weigh?

5. Elizabeth gave the bus driver a quarter. The fare was 8¢. The bus driver gave her 2 pennies and 3 nickels. Was this the right change?

6. On Saturday Fred sold 136 newspapers at 3¢ each. How much did he get for them?

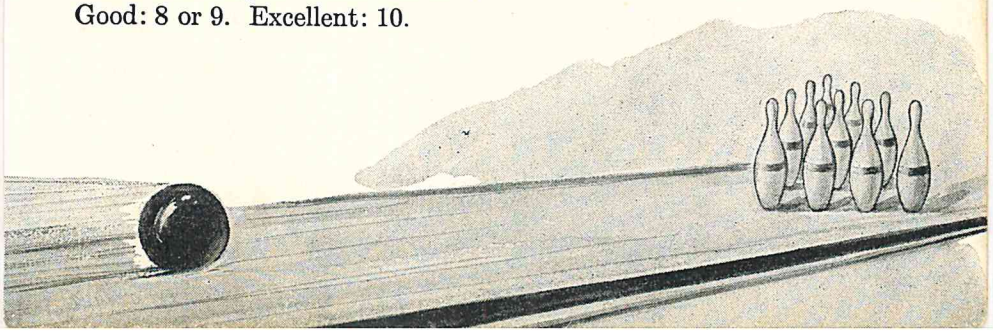
7. Arthur can get a pair of ice skates for $1.89. If he pays $3.90 more than this, he can get ice skates on shoes. How much do the skates on shoes cost?

8. Bob earns $.35 a week helping Mr. Lane and $1.25 a week delivering papers. How much does he earn in 11 weeks?

9. If 8 doz. pencils are sold at 5¢ each, how much money will they bring?

10. Each week George earns $.85 and spends only $.30 of it. How much can he save in 4 weeks?

This tells what your score means:
Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



CHAPTER REVIEW

1. Say the answers to the addition facts on page 4 and the subtraction facts on page 10. Use the addition facts on page 4 as multiplication facts and say the answers to them.

Add these numbers. In ex. 2 do the work in your head:

2.	16	28	7	9	36	19	8
	7	9	45	67	8	4	27

3.	34	84	70	16	76	82	25
	59	43	67	73	70	25	97
	43	75	13	58	34	62	42
	68	34	56	46	17	18	39
	12	46	55	16	23	75	19
	35	32	25	23	54	43	44

Subtract these numbers and check the work:

4.	9171	7265	1460	$50.00	$40.04
	7186	6368	620	45.25	20.84
5.	2158	3372	1377	$42.94	$60.00
	1859	1271	508	15.08	31.47

Multiply these numbers and check the work:

6.	69	209	316	$18.24	$32.68	$14.65
	60	8	7	9	5	8
7.	56	947	452	$43.87	$37.05	$12.38
	30	54	87	36	19	43
8.	87	125	569	$45.10	$79.83	$37.09
	20	61	94	15	38	27
9.	94	473	219	$10.05	$46.50	$19.75
	70	95	63	48	36	52

If you miss more than one example in any row, turn to the Practice Page for that row.

Add these numbers and check the work:

						PRACTICE PAGES
1.	413	341	652	925	314	7
	879	589	578	298	359	
	581	256	263	523	446	
	126	663	715	233	648	
2.	3631	1076	6592	2025	453	27
	7507	4808	744	7878	2064	
	1078	2341	5438	1658	1587	
	2775	2365	1279	4541	3726	

Subtract these numbers and check the work:

3.	926	508	930	821	673	12
	658	229	482	437	485	
4.	4461	3623	5695	5144	1871	14
	2585	1546	4759	3552	1372	
5.	6000	2904	3180	5002	4007	14
	3684	2159	2058	4469	3322	

Multiply these numbers and check the work:

6.	75	49	86	407	268	23
	48	73	25	39	46	
7.	3709	5319	1508	2368	2190	24
	15	26	71	32	49	
8.	59	49	39	76	79	25
	30	40	800	70	200	

Diagnostic test.

CHAPTER TWO

Long Division

YOSEMITE PARK

1. At school today Jim told about his visit to Yosemite Park. The Park is in California in the Sierra Nevada Mountains, 203 mi. east of San Francisco where Jim lives. Jim and his parents drove from San Francisco to the Park in their car. How many miles was the trip from San Francisco to the Park and back?

2. The children asked Jim, "What part of the Park did you like best?" Jim answered, "I liked the Yosemite Valley best. Some say it is the most beautiful valley in the world. The valley is 7 mi. long and about $1\frac{1}{2}$ mi. wide." Name some place that is about 7 mi. from your school, so you can get an idea of how long Yosemite Valley is.

3. Then Jim said, "The level floor of the valley is 3980 ft. above sea level. This means that it is 3980 ft. higher than the ocean near which I live." Tom interrupted, "3980 ft. is pretty high; it is more than $\frac{3}{4}$ mi. high. I figure it like this: 1 mi. = 5280 ft., $\frac{1}{4}$ mi. = 1320 ft., $\frac{3}{4}$ mi. = 3960 ft." Is Tom right?

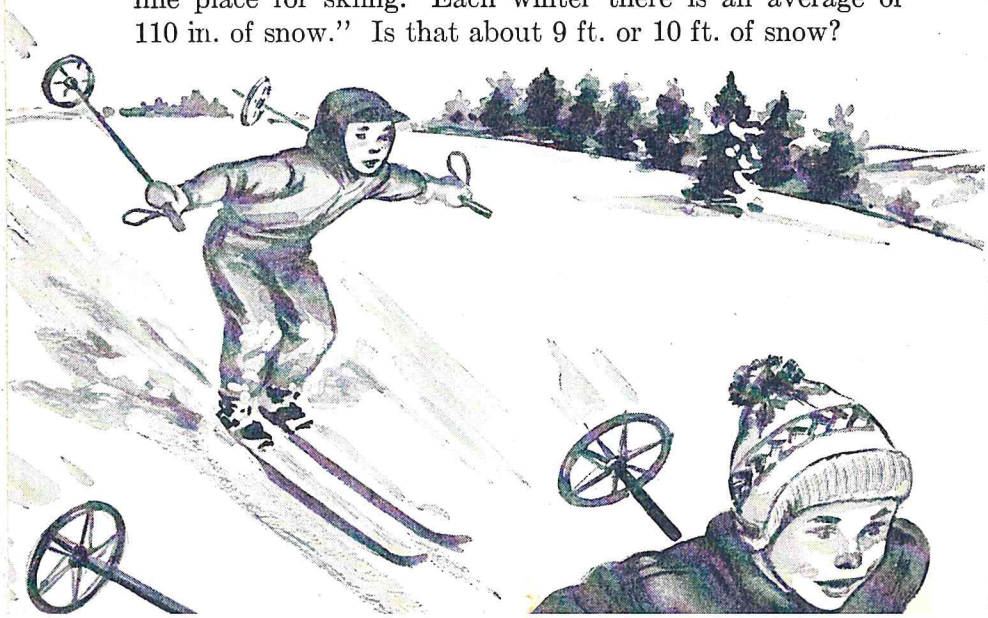
4. Jim continued, "Steep cliffs and walls of granite rise on each side of the valley. One of these granite cliffs, called El Capitan, rises 3604 ft. above the floor of the valley." If the floor of the valley is 3980 ft. above sea level, how many feet above sea level is the top of El Capitan? Is the top of El Capitan more than a mile above sea level? El Capitan is shown at the left.

1. Jim continued his story. He said, "My father liked Glacier Point best of all. Glacier Point is a peak at the top of one of the walls of the valley. You get a wonderful view from Glacier Point. You see 12 mountain peaks in the High Sierras and 2 beautiful waterfalls. People and houses down below in Yosemite Valley look very tiny. Glacier Point is 3254 ft. above the floor of the valley while the floor of the valley is 3980 ft. above sea level." How many feet above sea level is Glacier Point?

2. Jim said, "From Glacier Point you get a fine view of a granite peak called Half Dome which is one of the sights of the valley. Half Dome is 8852 ft. high." How many feet higher is Half Dome than Glacier Point? See ex. 1.

3. Jim said, "The highest waterfall in the valley is Yosemite Falls. It comes down the wall of the valley in 3 great leaps. The Upper Fall, which is the first leap, is 1430 ft. high. The Middle Fall is 815 ft. high and the Lower Fall is 320 ft." What is the total height of Yosemite Falls?

4. "And now," said Jim, "we want to go back to Yosemite Park in the winter. It must be beautiful then, too. It is a fine place for skiing. Each winter there is an average of 110 in. of snow." Is that about 9 ft. or 10 ft. of snow?



This is a test on the division facts. You should be able to give all the quotients orally within the time stated by the teacher:

1.	2)8	5)40	4)28	2)12	4)4	1)7
2.	1)3	2)18	8)72	5)10	1)9	2)0
3.	5)0	4)12	6)30	8)24	5)35	3)9
4.	8)8	6)42	9)63	7)35	3)12	7)0
5.	2)6	3)15	7)56	8)64	6)36	2)2
6.	1)0	9)45	2)10	5)30	7)63	4)0
7.	5)5	7)49	5)45	9)18	4)20	3)3
8.	1)6	7)21	4)32	3)18	6)48	1)2
9.	4)8	5)15	9)54	6)24	2)14	6)0
10.	3)0	8)32	3)27	9)72	5)25	1)4
11.	7)7	2)16	8)56	9)27	4)36	8)0
12.	3)6	4)24	6)18	7)28	8)48	9)9
13.	1)1	9)81	8)40	3)21	6)54	1)8
14.	9)0	7)42	9)36	8)16	5)20	6)6
15.	2)4	3)24	7)14	4)16	6)12	1)5

To THE TEACHER: See the suggestions on page 308.

1. A multiplication fact like $3 \times 7 = 21$ tells you that three 7's make 21. A division fact like $7\overline{)21}$ asks you how many 7's make 21. You cannot answer the question, "How many 7's make 21?", unless you know that $3 \times 7 = 21$. If you remember that $3 \times 7 = 21$, this tells you that the answer to $7\overline{)21}$ is 3. You see that multiplication and division are related. You cannot give the answer to a division fact unless you know the multiplication fact that goes with it.

2. If you forget the answer to a division fact like $6\overline{)48}$, ask the question, "How many 6's make 48?" Then try to remember the multiplication fact that tells you how many 6's make 48. If you remember that $6 \times 8 = 48$, you see that the answer to $6\overline{)48}$ is 8.

If you forget the answer to each of these facts, what question do you ask to help you find it?

3. $5\overline{)45}$ $6\overline{)42}$ $7\overline{)28}$ $8\overline{)64}$ $9\overline{)54}$ $8\overline{)56}$

4. $9\overline{)27}$ $4\overline{)36}$ $9\overline{)72}$ $5\overline{)35}$ $8\overline{)32}$ $9\overline{)63}$

Tell the missing numbers:

5. $7\overline{)42}$ equals . . . because . . . 7's make 42.

6. $6\overline{)54}$ equals . . . because . . . 6's make 54.

7. $7\overline{)63}$ equals . . . because . . . 7's make 63.

8. $8\overline{)72}$ equals . . . because . . . 8's make 72.

9. If you did not do well on the division test on page 39, first take the multiplication test again on page 4 to discover the multiplication facts that trouble you. Study these facts until you master them; see page 17. Then try the division test again on page 39 and you will find that you will do much better on it.

MEASURES OF LENGTH

1. Measures of length were not always the same as those we use today. Many years ago in England a yard was the distance from the point of the king's nose to the end of his outstretched arm. A foot was the length of the king's foot. An inch was equal to 3 grains of barley placed end to end.

2. Learn this table if you do not know it:

12 inches (in.)	=	1 foot (ft.)
3 feet (ft.)	=	1 yard (yd.)
5280 feet (ft.)	=	1 mile (mi.)

Tell what unit of measure you use to find:

3. The height of a boy; the length of your book.
4. The amount of material you need for curtains.
5. The distance you ride in an automobile.

Tell what number should be put in each space:

6. $\frac{1}{2}$ ft. = .. in.	2 ft. = .. in.	2 ft. 8 in. = .. in.
7. $\frac{1}{2}$ mi. = .. ft.	5 yd. = .. ft.	1 yd. 6 in. = .. in.
8. $\frac{1}{4}$ yd. = .. in.	6 ft. = .. yd.	3 yd. 2 ft. = .. ft.

Add up. Check the work by adding down:

1.	54	45	46	68	27	19	90	47
	36	20	26	16	27	38	15	32
	40	18	92	30	18	86	29	69
	15	36	36	44	46	27	94	43
	37	25	75	58	27	63	81	10
	28	49	24	13	75	48	33	43

Subtract. Check the work by adding:

2.	6996	2706	4099	4856	1000
	2259	1117	3039	4571	529
3.	5777	4000	3862	3002	6345
	2379	1635	2118	2473	2346

Multiply. Check the work by going over it:

4.	9×3958	23×486	$15 \times \$15.70$
5.	4×2706	61×538	$29 \times \$26.07$
6.	7×1689	85×693	$47 \times \$35.19$
7.	5×4827	49×147	$38 \times \$42.50$

Divide. Check the work:

8.	$3\overline{)36}$	$2\overline{)28}$	$4\overline{)88}$	$2\overline{)68}$	$5\overline{)250}$	$4\overline{)280}$
9.	$2\overline{)60}$	$4\overline{)48}$	$3\overline{)93}$	$5\overline{)55}$	$4\overline{)124}$	$3\overline{)210}$
10.	$2\overline{)62}$	$3\overline{)39}$	$2\overline{)44}$	$4\overline{)80}$	$3\overline{)249}$	$2\overline{)164}$
11.	$4\overline{)84}$	$2\overline{)66}$	$5\overline{)50}$	$3\overline{)96}$	$2\overline{)186}$	$5\overline{)450}$
12.	$2\overline{)24}$	$4\overline{)44}$	$3\overline{)63}$	$2\overline{)86}$	$5\overline{)105}$	$4\overline{)328}$

1. Jane has 50¢ to spend for paper hats for her party. At 6¢ each, how many paper hats can Jane buy?

To find out how many paper hats Jane can buy, you must divide 50 by 6. Think "There are eight 6's in 50." Write 8 above the 0 of 50. Multiply 6 by 8, which gives 48. Subtract 48 from 50, which leaves 2. 2 is called the *remainder;* 8 is called the *quotient.* Jane can buy 8 paper hats and will have 2¢ left.

$$\begin{array}{r} 8 \\ 6\overline{)50} \\ \underline{48} \\ 2 \end{array}$$

Divide. Find the quotient and remainder:

2.	6)9	8)28	9)51	7)54	8)60	9)16	7)33
3.	4)7	6)46	7)37	3)28	6)41	8)30	9)62
4.	5)7	9)57	6)49	8)22	4)26	6)65	5)47
5.	7)6	7)22	8)45	6)58	9)52	7)57	2)19
6.	8)9	8)63	7)50	9)43	7)68	5)18	6)27
7.	9)7	6)29	9)80	7)61	3)17	8)35	7)41
8.	6)8	7)55	5)43	8)75	6)25	9)66	8)51
9.	7)9	9)77	8)27	5)38	4)38	6)57	9)60
10.	8)15	8)39	6)53	9)24	7)51	4)15	6)47
11.	9)11	6)32	9)39	6)45	8)79	7)32	4)19
12.	6)10	9)50	7)64	8)46	5)29	9)78	7)53

Uneven division facts.

1. Last month our school earned money by giving a fair. After expenses were paid we had $56.87 to be divided equally among 6 school clubs. How much did each club get? Was any money left over?

You divide as shown here. The decimal point in the answer should be put over the decimal point in $56.87. This is called the long form of division because all the steps are shown. $56.87 is the *dividend*, 6 is the *divisor*, $9.47 is the *quotient*, and $.05 is the *remainder*. To check the work, multiply the quotient by the divisor and add the remainder to the product. The result should equal the dividend.

```
   $ 9.47
6)$56.87
  54
   28
   24
    47
    42
     5
```

Check

```
$ 9.47
     6
$56.82
   .05
$56.87
```

Divide and check the work:

2.	7)5160	9)5526	6)4227	5)4580	8)$59.09
3.	6)3890	8)5256	7)1736	9)3476	8)$45.55
4.	5)3127	9)1188	6)2034	9)2260	7)$31.95
5.	8)1541	6)1068	9)1521	8)3081	9)$31.74
6.	7)1178	5)5975	8)1625	9)5274	7)$22.96
7.	6)1852	9)3825	7)4935	8)2512	9)$57.20
8.	9)4403	6)2500	5)2688	7)2184	8)$20.64
9.	7)6409	9)7389	8)4999	6)5238	5)$48.80

Dividing the long way.

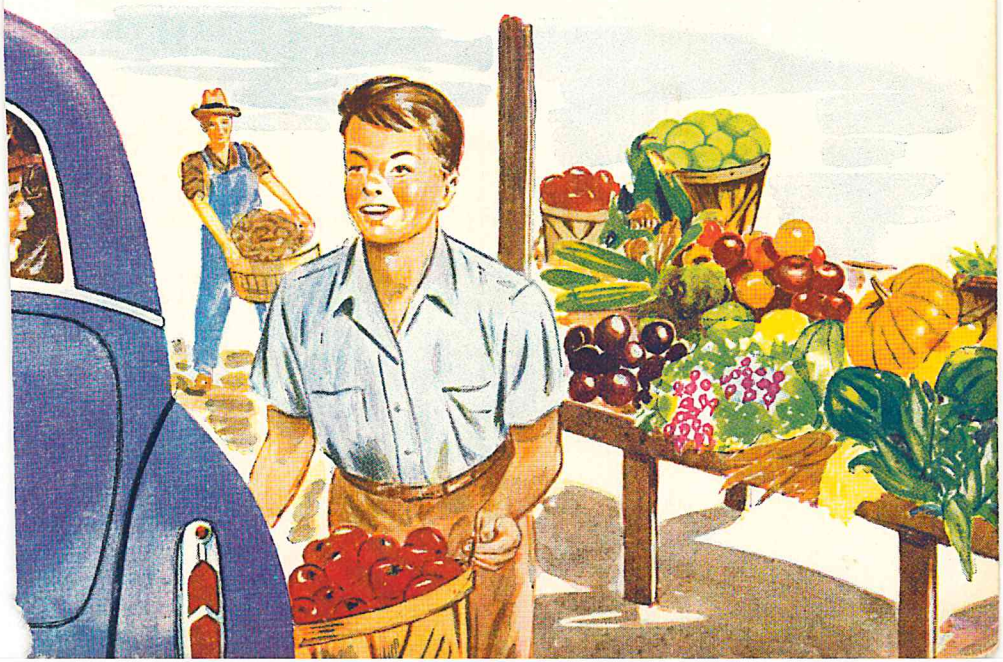
1. Late in summer Jack spent a week in the country with his uncle who had a roadside stand. Jack helped his uncle sell fruit and vegetables. One day a customer bought a basket of tomatoes for \$.50, a basket of apples for \$.65, and a dozen ears of sweet corn for \$.40. How much did Jack charge for these things?

2. How much change from \$2.00 did Jack give the customer? Count the change as Jack probably counted it.

3. Another customer bought $\frac{1}{2}$ doz. ears of corn at \$.40 a dozen, some cucumbers for \$.20 and a small basket of tomatoes for \$.30. How much did Jack charge for all these things?

4. A third customer bought 3 bunches of carrots at \$.10 a bunch, a squash for \$.18, and a basket of tomatoes for \$.50. How much did these things cost?

5. Jack's uncle had 56 baskets of tomatoes when he opened the stand that morning. When he closed the stand in the evening there were only 8 baskets left. How many baskets of tomatoes had he sold that day?



1. Dorothy has 30 sheets of colored paper to divide among 4 girls. How many sheets of paper will each girl get? How many sheets of paper will be left over?

You know how to divide 30 by 4 the long way as shown in *A*. You can also do all the work in your head, writing only the answer as in *B*. Think "Seven 4's are 28. 28 from 30 is 2." The quotient is 7 with a remainder of 2. Each girl will get 7 sheets of paper and there will be 2 sheets left.

A

```
    7
4)30
  28
   2
```

B

```
  7 R2
4)30
```

2. Tell how you think when you work each of the examples below the short way:

9 R1	4 R2	7 R1	6 R4	8 R3
3)28	5)22	2)15	5)34	4)35

Divide the short way. Give only the answers:

3.	3)2	5)13	4)17	2)19	3)14	5)19	4)23
4.	2)7	4)21	5)31	3)13	5)12	4)14	5)16
5.	4)3	3)11	4)18	5)27	4)25	3)20	5)44
6.	5)6	4)30	2)15	3)23	5)18	4)35	3)16
7.	3)8	5)36	4)27	5)42	3)28	5)29	4)34
8.	5)3	4)26	5)46	4)38	5)21	3)19	5)26
9.	4)9	3)22	5)24	3)29	4)15	5)33	4)39
10.	2)5	5)38	4)33	5)39	2)11	4)31	5)48

1. One day at the lake, Ted's father rented a boat to go fishing. He paid $1.35 for the use of the boat for 3 hours. How much per hour did it cost to rent the boat?

You can divide $1.35 by 3 in your head like this:

Think "13 ÷ 3 = 4, with 1 over." Write 4 in the quotient over the 3 of 13. Think of the 1 left over as written before the 5 in the dividend, making 15. Think "15 ÷ 3 = 5." Write 5 in the quotient. It cost $.45 an hour to rent the boat. Check the work.

$ .45
3)$1.35

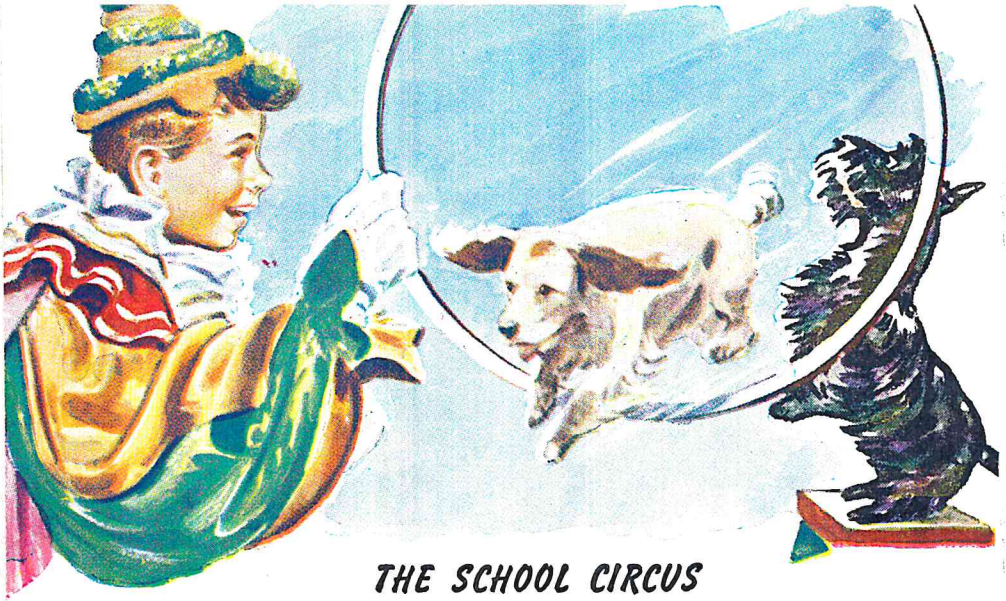
2. Another day Ted's father rented a larger boat. He paid $2.20 for the use of this boat for 4 hr. At that rate, what was the cost per hour?

3. Ted's father paid $105 to rent the cottage for 3 weeks. At that rate, what did it cost per week to rent the cottage?

Divide the short way, writing only the answer unless the teacher gives other directions. Check the work by multiplying:

4.	2)39	4)144	5)130	3)$1.17	2)$1.58
5.	5)70	3)171	4)109	2)$1.15	5)$2.06
6.	4)68	2)149	5)260	3)$1.42	4)$3.36
7.	3)51	5)276	2)198	4)$3.33	5)$3.16
8.	5)63	2)181	3)231	5)$2.61	3)$1.75
9.	4)56	5)216	4)292	2)$1.23	5)$4.65
10.	3)87	4)212	5)271	3)$2.01	2)$1.27
11.	2)52	3)208	4)188	5)$3.21	4)$1.49

Mental short division.



THE SCHOOL CIRCUS

1. Fred is selling tickets for the school circus which will be held in the gymnasium. He sold 18 tickets the first day, 20 the second day, and 22 the third day. Find the average number of tickets he sold per day.

To find the average, add the 3 numbers, which gives 60. Then divide 60 by 3; this gives 20 which is called the *average* of the three numbers. Fred sold an average of 20 tickets per day.

If Fred had sold exactly 20 tickets each day, he would also have sold 60 tickets in 3 days. The 18 tickets he sold the first day were 2 *less* than 20 but he made up this loss the third day when he sold 22 tickets which was 2 *more* than 20.

The average, 20, tells the number of tickets Fred would have sold each day if the daily sales had always been the same.

$$\begin{array}{r} 18 \\ 20 \\ 22 \\ \hline 3\overline{)60} \\ \hline 20 \end{array}$$

2. Tom is also selling tickets for the circus. He sold 14 tickets on Monday, 16 tickets on Tuesday, 18 on Wednesday, 13 on Thursday, and 14 on Friday. Find the average number of tickets he sold per day.

Divide the sum by 5 because 5 numbers are added.

1. Betty has been putting money in her bank each week for the last 4 weeks. The first week she put in 15¢; the second, 18¢; the third, 25¢; and the fourth, 14¢. Find the average amount per week Betty put in her bank.

2. Betty's brother Bill had 92¢ in his bank at the end of 4 weeks. What was the average amount he saved per week?

In this problem the sum 92 is given so there are no numbers to be added. Divide 92 by 4 to find the average.

3. Jane bought her lunch at school every day last week. On Monday she spent 18¢; on Tuesday, 22¢; on Wednesday, 16¢; on Thursday, 24¢; on Friday, 20¢. What was the average cost per day of Jane's lunch?

4. Jack kept an account of the money he spent for candy and ice cream in 4 weeks. The first week he spent 20¢; the second, 18¢; the third, 25¢; the fourth, 17¢. What was the average amount Jack spent per week?

5. Mary says she has spent $1.08 for school supplies in the 4 weeks since school began. What is the average amount per week Mary has spent for school supplies?

6. Bob says he has spent $1.52 for school supplies in 4 weeks. What is the average amount Bob has spent per week for school supplies?

7. Dick wondered what the average cost of his school books was. He found that the arithmetic cost $.96; the history, $1.28; the English book, $.92, and the music book, $1.08. What was the average cost per book?

8. Joe runs errands on Saturdays. These are the amounts he earned on the 4 Saturdays in September: 50¢, 75¢, 55¢, 80¢. On the average, how much did Joe earn per day for the 4 days?

9. Joe sold 96 newspapers in 4 days. Find the average number he sold per day.

1. The movie house near Bill's home gave 127 shows last month. An average of 475 tickets were sold for each show. How many tickets were sold at that movie house last month?

Multiply 475 by 7, which gives 3325. Write 3325 so that the right-hand figure 5 comes under the 7 of 127.

Multiply 475 by 2, which gives 950. Write 950 so that the right-hand figure 0 comes under the 2 of 127.

Multiply 475 by 1, which gives 475. Write 475 so that the right-hand figure 5 comes under the 1 of 127.

```
   475        Check
   127          127
  ----         ----
  3325          635
  950           889
 475            508
 -----         -----
 60325         60325
```

Add the partial products. The answer is 60,325. 60,325 tickets were sold last month. You can check the work by going over it.

Another way to check the work is to change the places of 475 and 127, writing 475 under 127 as shown above at the right. Then multiply again; the answer is 60,325. Since this answer is the same as the one you got at first, you call the work right.

2. Our school bought 235 geographies at $1.48 each. How much in all did the books cost?

3. Our school also bought 345 histories at $1.64 each. How much in all did the histories cost?

4. Study these examples. Then check the work by interchanging the numbers and multiplying again:

```
   628        374        716        795
   356        261        518        421
  ----       ----       ----       ----
  3768        374       5728        795
 3140        2244        716       1590
1884         748       3580       3180
------      -----      ------     ------
223568      97614      370888     334695
```

Place the right-hand figure of each partial product under the figure by which you are multiplying.

1. Mr. Brown said he received an average of $1.85 for each hen he sold last year. He sold 235 hens. How much did Mr. Brown receive for the hens?

2. Miss Smith runs a lunchroom part of the year. Last year she served an average of 115 persons a day. At that rate, how many persons did she serve in the 155 days the lunchroom was open?

3. A bus driver makes a daily run of 145 miles. How many miles does he drive in 246 days?

4. Our school lunchroom was open 175 days last year. It sold an average of 150 sandwiches a day. How many sandwiches did our lunchroom sell last year?

Multiply. Check the work by interchanging the numbers:

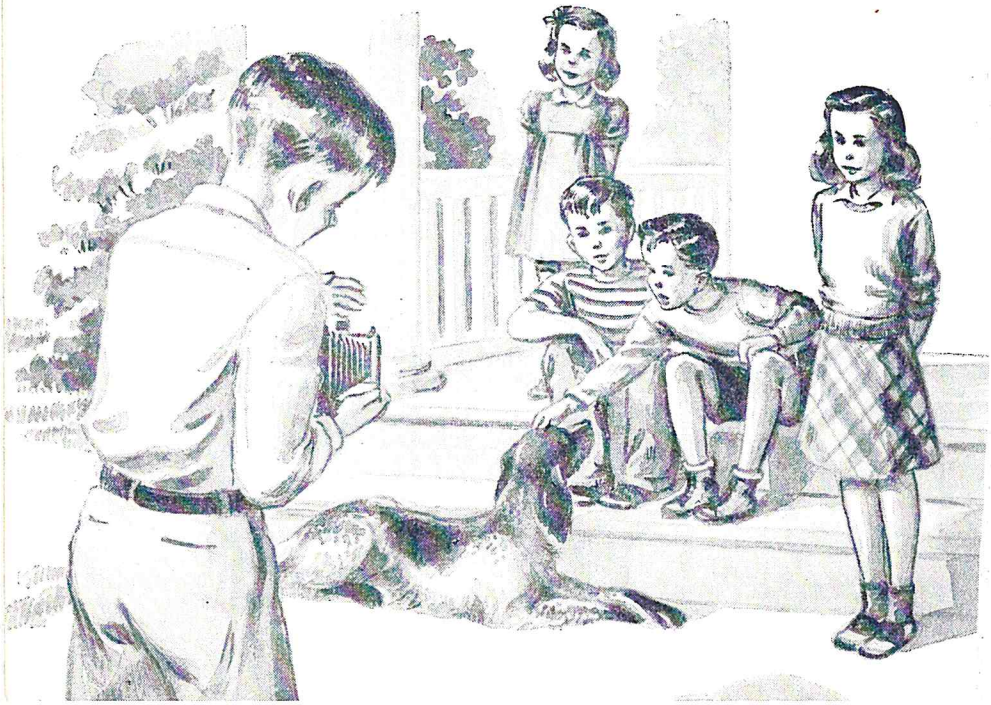
5.	732	619	384	549	194	358
	437	125	269	284	763	328
6.	276	270	658	509	614	369
	681	592	347	196	248	519
7.	513	921	495	276	267	853
	476	583	147	925	637	792
8.	148	387	591	490	458	276
	956	428	386	139	375	469
9.	817	892	367	158	803	354
	851	274	783	491	386	845
10.	591	376	642	264	743	908
	279	437	658	483	319	456
11.	664	309	864	357	919	480
	549	275	864	183	791	326

1. Peter likes to take pictures with his camera. On Saturday he earned 75¢ which he wants to spend for films. At 20¢ a roll, how many rolls of film can Peter buy? How much money will he have left? Peter answered these questions as shown in ex. 2.

2. Peter thought, "1 roll of film costs 20¢; 2 rolls will cost 40¢; 3 rolls will cost 60¢; 4 rolls will cost 80¢. I have 75¢ so I can buy 3 rolls of film and have some money left." How much money will Peter have left?

3. Suppose Peter had $1.30 and wanted to buy films that cost $.30 a roll. How many rolls could he buy? Would he have any money left? If so, how much? Do the work the same way it was done in ex. 2.

4. In ex. 2 and 3, multiplication is used to find how many rolls of film could be bought. It is easier to work these problems by division. On the next page you will learn how to divide by numbers like 20 and 30.



1. On this page you will learn how to divide 75 by 20.

(1) *Divide.* There are about as many 20's in 75 as there are 2's in 7. To divide 75 by 20, look at the 2 of 20 and at the 7 of 75. Think "There are three 2's in 7." Write 3 in the quotient over the 5 of 75.

$$\begin{array}{r} 3 \\ 20\overline{)75} \\ \underline{60} \\ 15 \end{array}$$

(2) *Multiply* 20 by 3, which gives 60. Write 60.

(3) *Subtract* 60 from 75, which leaves a remainder of 15.

(4) *Compare* the remainder, 15, with the divisor, 20. *The remainder must always be less than the divisor.* You see that 15 is less than 20 which is as it should be.

(5) The work above shows that there are three 20's in 75 with 15 left over. In this problem the work was done by division. In ex. 2 on page 52, Peter did the same problem by multiplication.

(6) *Check.* Multiply the divisor, 20, by the quotient, 3, which gives 60. Add the remainder, 15, which gives 75. Since 75 equals the dividend, the work is right.

Check

$$\begin{array}{r} 20 \\ \underline{3} \\ 60 \\ \underline{15} \\ 75 \end{array}$$

In the work above, 20 is the *divisor*, 75 is the *dividend*, 3 is the *quotient*, and 15 is the *remainder*. Division in which the divisor is a two-figure number is called *long division*. Division with a one-figure divisor is called *short division*.

Divide. Check the work by multiplying:

2.	$30\overline{)47}$	$40\overline{)87}$	$20\overline{)76}$	$50\overline{)97}$	$20\overline{)40}$
3.	$20\overline{)83}$	$30\overline{)92}$	$20\overline{)80}$	$40\overline{)79}$	$20\overline{)96}$
4.	$60\overline{)94}$	$40\overline{)64}$	$20\overline{)84}$	$30\overline{)55}$	$50\overline{)82}$
5.	$50\overline{)95}$	$60\overline{)75}$	$30\overline{)90}$	$20\overline{)97}$	$40\overline{)80}$
6.	$40\overline{)59}$	$20\overline{)91}$	$60\overline{)90}$	$40\overline{)67}$	$30\overline{)58}$

HOW MANY MILES DID THEY WALK?

1. In the city where George lives, 20 blocks make 1 mile. Yesterday George walked 60 blocks. How many miles did he walk?

2. George's brother Tom walked 80 blocks today. How many miles did Tom walk?

3. George lives 10 blocks from school. How many miles does he walk going to school and back once each day?

Divide. Check the work by multiplying:

4.	30)64	20)43	40)89	30)62	20)68
5.	20)31	40)72	30)44	20)46	30)67
6.	40)81	30)97	20)48	30)41	20)54
7.	20)45	30)42	40)83	20)67	30)69
8.	30)85	20)55	20)66	40)70	20)71
9.	20)53	30)71	40)92	30)75	40)91
10.	30)94	20)47	30)61	40)86	20)59
11.	40)93	20)86	20)52	30)63	50)96
12.	20)82	30)98	20)38	20)57	40)82
13.	30)72	20)95	40)84	30)70	20)51
14.	50)89	30)54	20)69	40)90	30)65
15.	30)66	50)79	40)85	20)98	30)93

1. The 21 girls in our troop of Brownie Scouts have 136 boxes of cookies to sell. If they divide the work equally, how many boxes should each girl sell? Will any boxes be left? If so, how many girls will each sell one extra box?

Since 21 is close to 20, there are about as many 21's in 136 as there are 20's in 136. When the divisor is 20, you divide by 2.

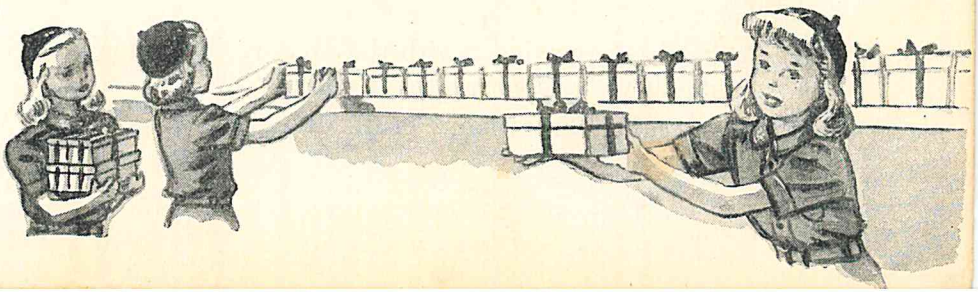
You cannot divide the 1 of 136 by 2 but you can divide 13 by 2. Think "How many 2's are there in 13?" Since there are six 2's in 13, write 6 over the last figure of 136. Tell how to finish the work.

```
      6
21)136
   126
    10
```

2. There are 31 girls in another Brownie troop who will try to sell 250 boxes of cookies. How many boxes should each girl in that troop sell? Will any boxes be left?

Divide. Check the work by multiplying:

3.	21)158	21)130	31)157	31)285	21)169
4.	41)390	31)217	21)189	21)175	31)259
5.	21)139	41)262	41)130	31)124	51)320
6.	30)143	20)107	21)115	40)351	31)186
7.	21)129	31)195	20)183	30)269	61)450
8.	31)200	40)163	21)179	21)126	51)431
9.	41)222	31)111	30)240	20)151	21)147



1. Last month the lunchroom sold 987 dishes of ice cream in 21 days. Find the average number of dishes of ice cream that were sold per day.

You must divide 987 by 21.

(1) *Divide* 98 by 21. 98 is called the *partial dividend* because it is the part of the dividend that you must use to get the first quotient figure. To divide 98 by 21, think "There are four 2's in 9." Write 4 in the quotient over the 8 of 98.

(2) *Multiply* 21 by 4, which gives 84. Write 84 under 98.

(3) *Subtract* 84 from 98, which leaves 14.

(4) *Compare* the remainder 14 with the divisor 21. 14 is less than 21, so 4 is the right quotient figure.

(5) *Bring down* 7 and write it after 14, making a new partial dividend of 147.

```
      47
21)987
   84
   147
   147
```

Check

```
  47
  21
 ---
  47
 94
 ---
 987
```

Repeat these five steps for the next quotient figure.

(1) *Divide* 147 by 21. Think "14 ÷ 2 = 7." Write 7 after 4.
(2) *Multiply* 21 by 7, which gives 147. Write 147 under 147.
(3) *Subtract* 147 from 147, which leaves 0.
(4) *Compare* the remainder 0 with the divisor 21. Since 0 is less than 21, 7 is the right quotient figure.
(5) There is no other figure in the dividend to bring down, so the division is completed. The quotient is 47. The lunchroom sold an average of 47 dishes of ice cream per day. Check by multiplying 47 by 21, as shown above.

2. There are 5 steps in finding each quotient figure:

(1) *Divide* the partial dividend by the divisor.

(2) *Multiply* the divisor by the quotient figure.

(3) *Subtract.*

(4) *Compare* the remainder with the divisor. The remainder should always be less than the divisor.

(5) *Bring down* the next figure of the dividend.

1. One day last week the girls in Jane's cooking class made 252 cookies. If they divided the cookies equally among the 21 girls, how many did each girl get?

2. Yesterday the girls made 315 pieces of molasses candy. If they shared the candy equally, how many pieces did each of the 21 girls get?

3. Today the girls made fudge. They had 108 pieces. If the 21 girls shared the candy equally, how many pieces did each girl get? Were any pieces left over?

Divide and check. In each exercise divide by the first figure of the divisor to estimate each quotient figure:

4.	21)672	21)495	31)1398	31)1953	21)1499
5.	21)886	22)550	22)1144	33)1720	34)1462
6.	31)658	22)729	32)1067	30)1723	45)1039
7.	31)415	23)493	32)1698	43)2322	22)1574
8.	40)480	23)759	33)1023	43)1381	31)1929
9.	41)984	42)973	43)1080	44)1936	35)1157
10.	41)765	22)977	41)1690	22)1782	34)1734
11.	20)689	42)882	35)1470	23)1196	44)1408

When a two-figure divisor ends in 1, 2, 3, 4, or 5, divide by the first figure of the divisor to estimate each quotient figure.

1. Jack says he can walk 3 mi. in an hour. At that rate, how many miles can Jack walk in 2 hr.?

2. Bill averages 7 mi. an hour on his bicycle. How many miles can he ride in 2 hr.?

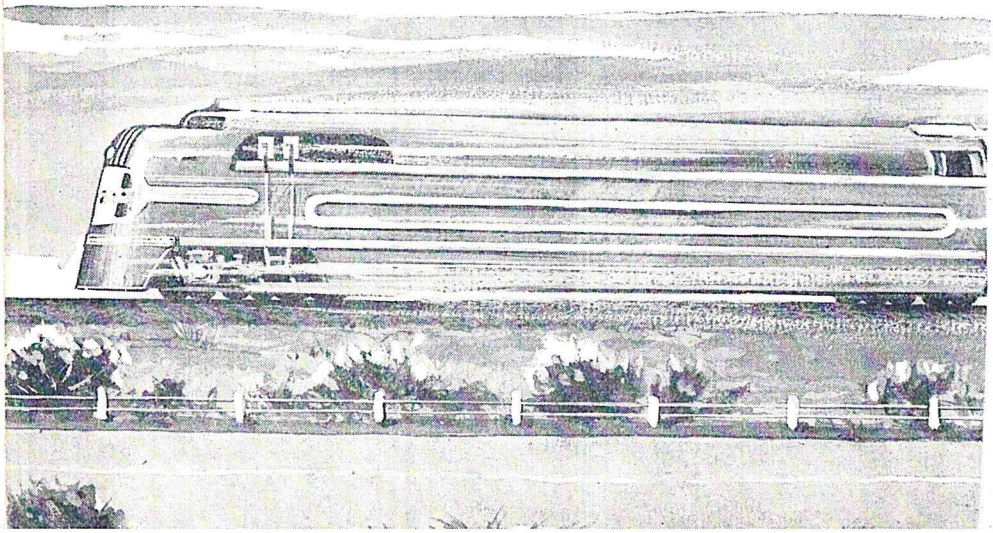
3. The number of miles traveled in an hour is called the *rate* or *speed* per hour. In ex. 1 the rate at which Jack walks is 3 mi. per hour. In ex. 2 the rate at which Bill rides is 7 mi. per hour. What is the rate in ex. 4? in ex. 5?

4. Mr. Bell drives his truck at the rate of 22 mi. an hour when it is loaded. It takes him 2 hr. to drive to market. What is the distance to market?

5. When Jim's father is taking a trip, he drives his car at an average of 35 mi. an hour. At that rate, how many miles can he drive in 5 hr.?

6. A fast train between New York and Washington, D. C. makes the trip in 4 hr. The train averages 57 mi. per hour. What is the distance between the two cities?

To find the distance traveled, multiply the rate per hour by the number of hours.



1. Henry walked 8 mi. in 2 hr. How many miles an hour, or at what rate per hour, did Henry walk?

2. In ex. 1 the distance is 8 mi. and the time is 2 hr. What do you do in ex. 1 to find the rate per hour? What is the distance in ex. 3? in ex. 4?

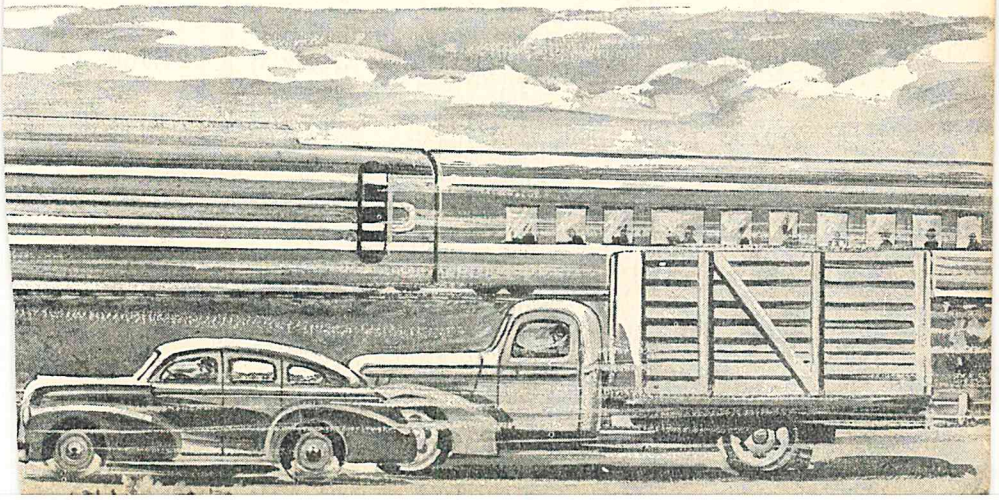
3. Mr. Allen drove his car 748 mi. on a business trip. His driving time was 22 hr. Find the average rate per hour at which he drove his car.

4. It is 1188 mi. from Tom's home to Chicago. One of the fast trains makes this trip in 22 hr. How many miles an hour does the train average?

5. Mr. Cox averages 35 mi. an hour in his new car. How many hours will it take him to drive 420 mi.?

6. If a fast train travels at the rate of 62 mi. per hour, how many hours will it take the train to make a trip of 310 mi.?

To find the rate per hour, divide the distance by the number of hours. To find the number of hours, divide the distance by the rate per hour.



1. Our school has 448 tickets to sell for one performance of the class play. If 32 boys and girls sell the tickets, how many should each one take?

2. If the class play is given three times, we will have 1344 tickets to sell. Then 84 boys and girls will sell the tickets. How many tickets should each one sell?

3. The cost of one ticket for the class play is $.25. Find the cost of 448 tickets for one performance. Find the cost of 1344 tickets for three performances.

4. Study these exercises. Then copy the dividend and divisor of each exercise and do the work yourself:

```
                Check                          Check
      63         63          43            43
33)2079         33       45)1946          45
   198          189         180           215
    99          189         146           172
    99          2079        135           1935
                             11             11
                                           1946
```

Divide. Check the work by multiplying:

5. 81)991 52)1204 35)1085 22)1125 31)1364

6. 44)975 21)1113 23)1199 73)1978 35)1470

7. 21)924 54)1404 33)1157 51)1228 21)1365

8. 24)768 32)1664 41)3444 21)1776 34)1156

9. 32)747 21)1932 75)3075 33)1782 42)1180

10. 23)989 82)3780 45)1845 34)1435 43)2709

11. 35)840 54)2930 62)2930 33)2678 21)1995

Here are three sets of division examples. If you get all the examples right in the first set, you do not need to do the other two sets. If you need more practice, do Sets II and III.

Divide and check the work:

SET I

1.	31)682	42)969	21)1596	34)1195	31)1054
2.	23)738	34)850	43)2759	32)1344	22)1386
3.	50)893	25)525	35)1788	21)1291	44)2728
4.	21)956	24)576	23)1175	33)2046	52)3921
5.	45)949	20)580	41)3116	74)1136	64)1731

SET II

6.	24)556	31)775	55)1768	21)1722	45)1935
7.	25)529	63)760	32)2016	42)3528	73)2555
8.	34)820	23)785	53)1855	22)1197	41)3409
9.	35)875	40)960	21)1134	63)4550	35)1190

SET III

10.	30)870	23)966	44)3129	84)1176	41)2214
11.	21)777	42)925	43)1978	65)2737	34)2079
12.	31)868	35)778	21)1199	21)1176	22)1166
13.	25)558	34)887	62)3286	32)2339	21)1785

1. Last Saturday 32 children went together to the zoo to see the animals. The total expenses of the trip were $4.90. If the children shared the expenses equally, how much did each child pay? How many children paid an extra cent?

You divide dollars and cents in long division just as you divide other numbers. Be sure to place each quotient figure in the right position. Then place the decimal point in the quotient above the decimal point in $4.90. The answer is $.15 with a remainder of 10¢. If each child pays $.15, there will be 10¢ still to be paid. 10 children will each have to pay an extra cent. Check the work.

```
      $ .15
32)$4.90
    3 2
    1 70
    1 60
      10
```

Check

```
$ .15
  32
  30
  45
$4.80
 .10
$4.90
```

2. In July Mrs. Smith paid $12.71 for milk. July has 31 days. Find the average cost of the milk per day.

Divide and check the work:

3. 35)$7.35	43)$26.23	81)$13.99	65)$29.37
4. 44)$9.24	84)$27.80	52)$29.23	92)$33.12
5. 25)$7.80	22)$15.85	45)$14.47	74)$23.75
6. 24)$5.28	71)$12.78	33)$20.13	42)$17.31
7. 52)$8.89	55)$29.23	95)$26.62	83)$39.01
8. 45)$9.90	32)$16.32	61)$34.32	34)$17.75
9. 63)$9.47	93)$22.39	75)$24.75	21)$15.20
10. 32)$8.38	62)$14.40	31)$16.50	54)$44.36

If you are skillful in computing, you should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 5 min.

1.	762	861	180	524	746	475
	928	577	259	862	376	952
	514	860	821	348	952	340
	363	321	157	657	979	764
	210	416	912	879	219	509

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2.	462	750	957	800	664	694
	174	152	699	388	591	397
3.	919	840	444	811	721	962
	520	576	356	753	378	505

Multiplication Test

Copy and multiply: Time: 4 min. after copying.*

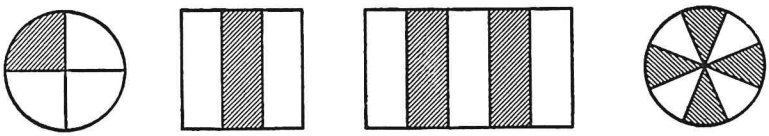
4.	541	954	159	458	496	294
	63	28	37	54	19	76

Division Test

Copy and divide: Time: 4 min. after copying.*

5.	3)267	8)1232	6)2803	9)3825
6.	5)383	7)4564	4)2936	2)1704

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 308.



1. Into how many equal parts is the first circle divided? What part of it is shaded? What part is not shaded?

2. You write one fourth like this: $\frac{1}{4}$. One fourth is also called *one quarter*. You write three fourths like this: $\frac{3}{4}$. Three fourths is the same as three quarters. Are all four quarters of the circle the same size?

3. How many equal parts are there in the square above? What part is shaded? Show how to write your answer. What part is not shaded? Write your answer in figures.

4. Into how many equal parts is the rectangle divided? Write the fraction that shows what part of the rectangle is shaded. What fraction tells the part that is not shaded?

5. Write fractions that show both the shaded and the unshaded parts of the last circle.

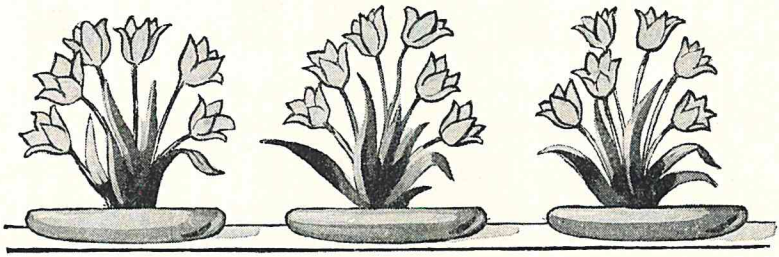
6. Draw a square 2 in. on a side and divide it into fourths. Shade three parts of the square. What fraction tells the part that is shaded? What fraction tells the part that is not shaded? Can you divide this square into fourths in another way? If so, what is this way?

7. Draw 2 circles of the same size. Divide one into sixths and the other into eighths. Is $\frac{1}{8}$ of a circle larger or smaller than $\frac{1}{6}$ of it?

8. You see that there are four fourths in the first circle above. You write it like this: $\frac{4}{4}$. One whole circle equals four fourths. You write it like this: $\frac{4}{4} = 1$.

9. How many eighths are there in 1 whole circle? How many thirds are there in 1 whole square? How many fifths are there in 1 whole rectangle?

1. Mother picked 18 flowers. She divided them into 3 equal bunches as shown below:



What part of all the flowers is 1 bunch? 2 bunches? How many flowers are there in each bunch? How many are $\frac{1}{3}$ of 18? How many are $\frac{2}{3}$ of 18? $\frac{3}{3}$ of 18?

2. Mary picked 24 flowers. She gave $\frac{2}{3}$ of them to her aunt. How many flowers did she give her aunt?

You can find $\frac{2}{3}$ of 24 flowers like this:

$\frac{1}{3}$ of 24 flowers = 8 flowers
$\frac{2}{3}$ of 24 flowers = 2×8 flowers, or 16 flowers

3. How many rolls are there in $\frac{3}{4}$ doz.? in $\frac{2}{3}$ doz.?
4. Find the cost of $\frac{3}{4}$ yd. of cloth at 80¢ a yard.
5. How many ounces are there in $\frac{1}{8}$ lb.? in $\frac{3}{8}$ lb.? in $\frac{5}{8}$ lb.?
6. How many inches are there in $\frac{1}{2}$ ft.? in $\frac{2}{3}$ ft.? in $\frac{3}{4}$ ft.?
7. How many quarts are there in $\frac{1}{2}$ pk.? in $\frac{1}{4}$ pk.? in $\frac{3}{4}$ pk.?

Find the answers:

8. $\frac{1}{4}$ of 20
$\frac{3}{4}$ of 20

9. $\frac{1}{3}$ of 21
$\frac{2}{3}$ of 21

10. $\frac{1}{5}$ of 35
$\frac{3}{5}$ of 35

11. $\frac{1}{8}$ of 72
$\frac{7}{8}$ of 72

12. $\frac{1}{8}$ of 64
$\frac{3}{8}$ of 64
$\frac{5}{8}$ of 64

13. $\frac{1}{7}$ of 14
$\frac{3}{7}$ of 14
$\frac{5}{7}$ of 14

14. $\frac{1}{9}$ of 27
$\frac{4}{9}$ of 27
$\frac{8}{9}$ of 27

15. $\frac{1}{2}$ of 32
$\frac{1}{4}$ of 32
$\frac{3}{4}$ of 32

16. $\frac{1}{9}$ of 54
$\frac{2}{9}$ of 54
$\frac{7}{9}$ of 54

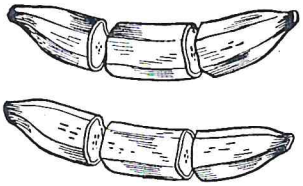
17. $\frac{1}{8}$ of 32
$\frac{3}{8}$ of 32
$\frac{7}{8}$ of 32

18. $\frac{1}{7}$ of 28
$\frac{4}{7}$ of 28
$\frac{6}{7}$ of 28

19. $\frac{1}{5}$ of 45
$\frac{3}{5}$ of 45
$\frac{4}{5}$ of 45

1. Jack, Fred, and Bob are brothers. On Saturday they went on a hike, taking along a lunch their mother had put in a box. When noon came, they opened the box. They found some sandwiches and 2 big bananas. How could the 2 bananas be divided equally among 3 boys?

Bob said, "I can do it. I will divide 1 banana into thirds and give each of us $\frac{1}{3}$ of it. Then I will divide the other banana into thirds and give each of us $\frac{1}{3}$ of that. We will each get $\frac{2}{3}$ of a banana in all." Is Bob right?



2. Bob has shown that if 2 things are divided equally among 3 boys each boy gets $\frac{2}{3}$ of *one* thing. That is, $2 \div 3 = \frac{2}{3}$. When you write $2 \div 3$ as $\frac{2}{3}$, the line between the 2 and the 3 means "divided by." You see that a fraction may be used to show division. For example, $\frac{4}{5} = 4 \div 5$; $\frac{3}{4} = 3 \div 4$; $\frac{8}{3} = 8 \div 3$; $\frac{3}{3} = 3 \div 3$; $\frac{3}{1} = 3 \div 1$, or 3.

Show what part of a candy bar each child will get:

3. If 1 candy bar is divided equally between 2 girls.
4. If 3 candy bars are divided equally among 4 girls.
5. If 4 candy bars are divided equally among 5 boys.
6. If 2 candy bars are divided equally among 5 boys.
7. Since $4 \div 1 = 4$, any whole number like 4 can be written in the form of a fraction like this: $\frac{4}{1}$.

Write each of these as a fraction:

8.	$8 \div 9$	$5 \div 6$	$12 \div 5$	$14 \div 2$	7
9.	$4 \div 5$	$3 \div 7$	$18 \div 7$	$16 \div 5$	4
10.	$3 \div 4$	$6 \div 5$	$15 \div 4$	$13 \div 6$	3
11.	$1 \div 3$	$3 \div 1$	$10 \div 3$	$19 \div 4$	8
12.	$4 \div 3$	$2 \div 9$	$11 \div 2$	$12 \div 7$	5

1. Mrs. White divided 5 yd. of ribbon equally between 2 girls. How many yards did each girl get?

When you divide 5 yd. by 2, you get 2 yd. with 1 yd. left over, which you have not yet divided. If you divide this 1 yd. of ribbon between the 2 girls, each girl gets $\frac{1}{2}$ yd. So each girl gets $2\frac{1}{2}$ yd. in all. You see that the $\frac{1}{2}$ at the end of $2\frac{1}{2}$ is obtained by dividing the remainder 1 by the divisor 2.

$$\begin{array}{r} 2\frac{1}{2} \\ 2\overline{)5} \end{array}$$

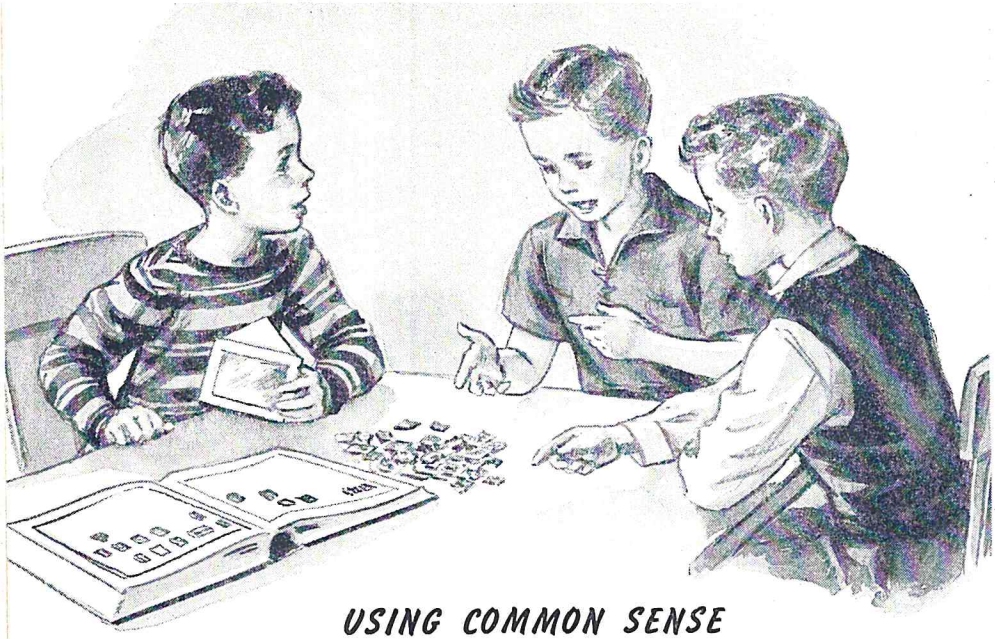
When you have a remainder in division, you can write it over the divisor, making a fraction in the quotient.

2. Study these examples:

$$\begin{array}{r} 18\frac{3}{4} \\ 4\overline{)75} \\ \underline{4} \\ 35 \\ \underline{32} \\ 3 \end{array} \qquad \begin{array}{r} 19\frac{5}{8} \\ 8\overline{)157} \\ \underline{8} \\ 77 \\ \underline{72} \\ 5 \end{array} \qquad \begin{array}{r} 25\frac{3}{5} \\ 5\overline{)128} \\ \underline{10} \\ 28 \\ \underline{25} \\ 3 \end{array} \qquad \begin{array}{r} 22\frac{5}{21} \\ 21\overline{)467} \\ \underline{42} \\ 47 \\ \underline{42} \\ 5 \end{array}$$

Divide. Write the remainder as a fraction in the quotient:

3.	$3\overline{)28}$	$2\overline{)39}$	$5\overline{)92}$	$4\overline{)371}$	$8\overline{)351}$	$21\overline{)737}$
4.	$5\overline{)37}$	$4\overline{)75}$	$3\overline{)46}$	$7\overline{)460}$	$4\overline{)305}$	$20\overline{)947}$
5.	$2\overline{)45}$	$6\overline{)83}$	$2\overline{)57}$	$3\overline{)860}$	$6\overline{)451}$	$30\overline{)521}$
6.	$3\overline{)95}$	$9\overline{)74}$	$8\overline{)94}$	$5\overline{)274}$	$9\overline{)500}$	$31\overline{)480}$
7.	$6\overline{)77}$	$3\overline{)59}$	$4\overline{)53}$	$2\overline{)893}$	$7\overline{)650}$	$10\overline{)283}$
8.	$7\overline{)81}$	$5\overline{)74}$	$8\overline{)91}$	$6\overline{)383}$	$4\overline{)725}$	$22\overline{)695}$
9.	$2\overline{)93}$	$4\overline{)87}$	$7\overline{)95}$	$9\overline{)284}$	$2\overline{)657}$	$21\overline{)760}$



USING COMMON SENSE

1. Joe, Bill, and Fred bought a package of 25 stamps. Joe said that they should divide the stamps equally so he divided 25 by 3 to find out how many stamps each of them should get. Then he said, "Each one of us should have $8\frac{1}{3}$ stamps." Do you agree with Joe?

$$\begin{array}{r} 8\frac{1}{3} \\ 3\overline{)25} \end{array}$$

2. Bill said, "No one wants $\frac{1}{3}$ of a stamp. We will each have 8 stamps and there will be 1 stamp left. We can give it to Betty." Bill says the answer is 8 R1 and not $8\frac{1}{3}$. Is he right?

$$\begin{array}{r} 8\ \text{R}1 \\ 3\overline{)25} \end{array}$$

3. In division problems it is not always sensible to divide the remainder to make a fraction in the quotient. In solving problems always decide whether the remainder should be left as a remainder or written as a fraction in the quotient.

In each problem suppose that the things are to be shared equally. Tell which way you should write the remainder:

4. If 3 children share 10 chicks; if 4 boys share 7 apples.
5. If 2 girls share 3 cookies; if 3 boys share 25 marbles.
6. If 4 children share 5 dishes of ice cream.

1. Mr. King uses his car for business. Last month he paid $11.13 for 53 gallons of gasoline. What was the average price of the gasoline per gallon?

2. Our class of 33 pupils shared equally the cost of a Halloween party at school last week. The total expenses were $7.59. How much did each pupil pay?

3. The school store bought 72 notebooks of the same kind for $9.36. Find the cost of each notebook.

4. The 252 pupils in the Park School went to the museum in busses. If 42 children rode in each bus, how many busses did they fill?

Divide and check. In ex. 5 to 14, write the answers with remainders; in ex. 15 to 19, express remainders as fractions in the quotients:

5. 944 ÷ 41	3486 ÷ 83	4331 ÷ 52	1858 ÷ 71
6. 799 ÷ 33	2752 ÷ 64	1071 ÷ 21	2405 ÷ 52
7. 709 ÷ 32	2195 ÷ 81	4371 ÷ 93	2275 ÷ 54
8. 929 ÷ 22	2032 ÷ 65	1433 ÷ 55	2519 ÷ 93
9. 837 ÷ 31	1484 ÷ 53	4982 ÷ 94	1984 ÷ 32
10. 793 ÷ 61	1520 ÷ 95	1344 ÷ 21	3427 ÷ 55
11. 576 ÷ 32	1364 ÷ 22	3222 ÷ 73	2240 ÷ 64
12. 997 ÷ 21	5801 ÷ 61	2559 ÷ 75	1944 ÷ 81
13. 943 ÷ 23	6725 ÷ 92	1328 ÷ 83	2352 ÷ 84
14. 902 ÷ 41	1185 ÷ 74	2860 ÷ 55	1100 ÷ 61
15. 700 ÷ 33	1120 ÷ 35	1178 ÷ 23	1431 ÷ 44
16. 579 ÷ 22	1633 ÷ 71	2332 ÷ 44	3348 ÷ 54
17. 865 ÷ 41	4153 ÷ 92	2237 ÷ 42	1168 ÷ 73
18. 918 ÷ 54	1390 ÷ 21	1489 ÷ 33	3070 ÷ 42
19. 767 ÷ 51	1088 ÷ 34	3956 ÷ 43	2487 ÷ 54

Tell whether you add, subtract, multiply, or divide to get the answer. If the problem has two steps, tell what you do in each step:

1. You know the cost of a bus ticket. How do you find the cost of several bus tickets?

2. You know the weight of each of several boxes. How do you find the average weight per box?

3. You know the cost of a new bicycle and of a used bicycle. How do you find the difference in the costs?

4. You know the number of pupils in each grade in your school. How do you find the total number of pupils in the whole school?

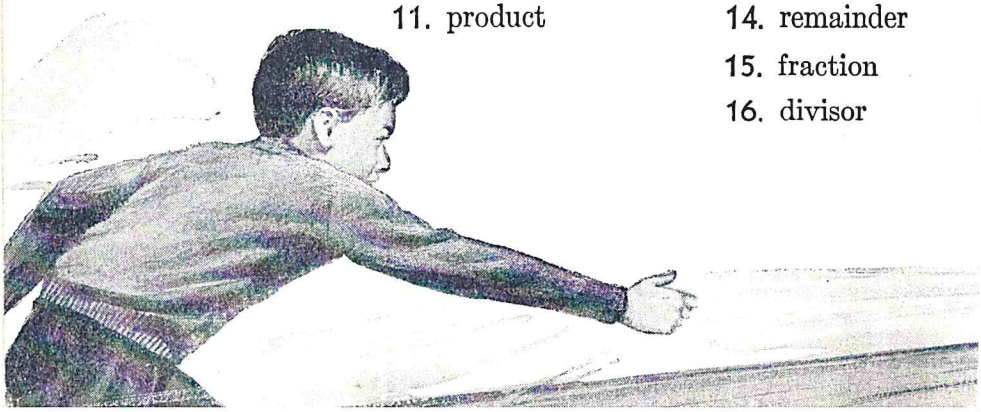
5. You know the cost of a tent and the number of boys that are planning to buy it. How do you find each one's share of the cost?

6. You know the cost of a kit for making a model boat. You also know that the amount of money you have is not enough to buy it. How do you find how much more money you need?

THE LANGUAGE OF ARITHMETIC

Show that you know what each word means by using it in a sentence or by giving an illustration of it:

7. dividend
8. average
9. difference
10. subtrahend
11. product
12. multiplier
13. quotient
14. remainder
15. fraction
16. divisor



1. It costs Bill \$.81 for a one-way ticket by bus to the city. A round-trip ticket costs \$1.50. How much does Bill save by buying a round-trip ticket?

2. Mr. Lee can drive his car about 18 mi. on a gallon of gasoline. If he has 8 gal. of gasoline in the tank, about how many miles in all can he drive?

3. Mr. Smith took his family on an automobile trip. He bought 34 gal. of gasoline at a total cost of \$7.48. What was the average cost of the gasoline per gallon?

4. An airplane makes a trip of 960 mi. in 6 hr. How many miles per hour does the plane average?

5. Last week the attendance in our class was as follows: 32 pupils on Monday, 35 on Tuesday, 31 on Wednesday, 33 on Thursday, and 34 on Friday. What was the average daily attendance in our class last week?

6. Helen bought 3 yd. of dress material at \$.45 a yard. How much change did she get from \$2.00?

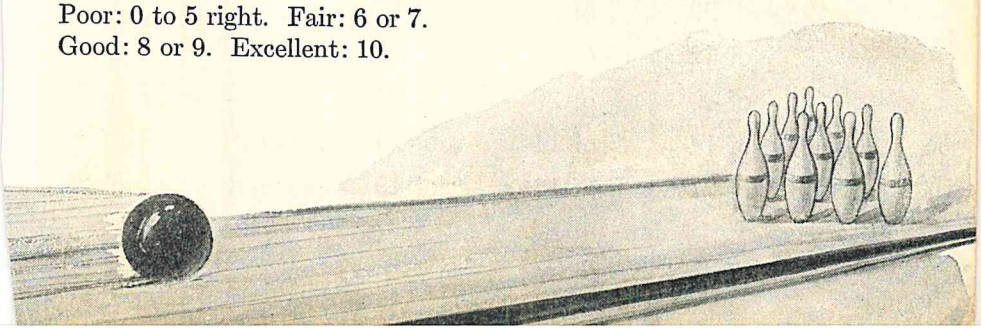
7. At an average rate of 28 mi. per hour, how many miles can you travel in 8 hr.?

8. The girls in the cooking classes at school made 1149 pieces of candy to sell at the fair. They put 22 pieces of candy in each box. How many boxes did they fill? Were any pieces of candy left over?

9. Yesterday the lunchroom had 215 sandwiches. There were 9 left after lunch. How many sandwiches were sold?

10. Find the cost of $\frac{7}{8}$ yd. of blue ribbon at \$.40 a yard.

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. It is $\frac{1}{4}$ mi. around the running track at our school. How many feet is it around the track? 1 mi. = 5280 ft.

2. Last month Mrs. Lee used 8 doz. eggs and paid \$3.60 in all for them. What was the average price per dozen that Mrs. Lee paid for the eggs?

3. Three girls divided 10 yd. of cloth equally. How many yards did each girl have?

4. Three boys divided 25 pencils equally. How many pencils did each boy get?

5. Mr. Baker drove his car 6 hr. to make a trip of 216 mi. What was his average speed in miles per hour?

Divide and check the work:

6.	6)732	20)960	30)1847	20)1580	40)\$19.60
7.	8)985	31)189	22)1342	43)2279	65)\$46.80
8.	7)602	23)529	55)1375	21)1100	72)\$18.72
9.	9)199	61)793	33)1426	53)3498	41)\$25.83
10.	5)433	32)736	63)1776	95)4377	42)\$18.90
11.	4)139	51)918	62)1433	71)4544	52)\$39.52

Find the answers:

12.	$\frac{1}{3}$ of 27	$\frac{2}{3}$ of 27	$\frac{1}{5}$ of 45	$\frac{2}{5}$ of 45	$\frac{4}{5}$ of 45
13.	$\frac{1}{4}$ of 32	$\frac{3}{4}$ of 32	$\frac{1}{8}$ of 24	$\frac{3}{8}$ of 24	$\frac{7}{8}$ of 24
14.	$\frac{1}{6}$ of 30	$\frac{5}{6}$ of 30	$\frac{1}{9}$ of 36	$\frac{5}{9}$ of 36	$\frac{7}{9}$ of 36
15.	$\frac{1}{7}$ of 14	$\frac{2}{7}$ of 14	$\frac{3}{7}$ of 28	$\frac{4}{7}$ of 21	$\frac{5}{7}$ of 35
16.	$\frac{2}{3}$ of 21	$\frac{3}{4}$ of 16	$\frac{5}{8}$ of 40	$\frac{5}{6}$ of 18	$\frac{3}{5}$ of 20

If you miss more than one example in any row, turn to the Practice Page for that row.

Multiply these numbers:

					PRACTICE PAGES
1.	4519 39	4378 46	3890 82	$26.90 15	24
2.	298 347	647 192	509 486	$3.87 235	51

Divide and check. Write R before each remainder:

3.	4)27	6)41	9)74	7)36	5)38	43
4.	7)31	9)83	5)49	8)53	6)52	43
5.	20)62	40)71	30)76	50)94		54
6.	31)76	21)95	41)169	21)177		55
7.	22)462	51)816	41)1277	32)1097		57
8.	3)$8.58	54)$8.69	72)$10.80	93)$14.88		62

Divide and check. Write the remainder as a fraction in the quotient:

9.	6)289	4)351	7)163	9)216	67
10.	5)367	3)287	8)280	6)355	67

Find the answers:

11.	$\frac{1}{8}$ of 56	$\frac{3}{8}$ of 56	$\frac{1}{6}$ of 18	$\frac{5}{6}$ of 18	65

Diagnostic test.

FIR TREE
TAVERN

CHAPTER THREE

Adding and Subtracting Like Fractions

POST RIDERS IN COLONIAL DAYS

In Colonial days men on horseback, called post riders, carried letters, newspapers, and small packages from city to city. On post day people hurried to the inn as soon as they heard the post rider blow his horn. Later on faster and still faster mail delivery was made, first by stagecoach, then by railroads, and today by airplane.

1. On the first Monday in January, 1673, letters began to be sent once each month between New York and Boston, a distance of about 234 mi. Two post riders started that day, one from Boston, the other from New York. Saturday evening they met at Saybrook, Connecticut, halfway between the two cities. There they exchanged letters. On Monday morning each man started back from Saybrook, arriving at his home city by Saturday evening. How many days did it take letters to go from Boston to New York in 1673? How many miles is it from Boston to Saybrook? How many miles is it from Saybrook to New York?

2. Envelopes were not used. Each letter was folded in such a way that it was easy to see if it was a single letter of one sheet of paper or a double letter of two sheets. Double letters cost twice as much to send as single ones. These were the prices for single letters:

Up to 50 mi., 8¢	Up to 200 mi., 20¢
Up to 100 mi., 15¢	Up to 400 mi., 25¢

Find the cost for double letters for the distances given.

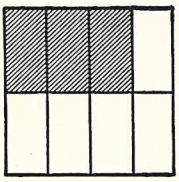
1. Post riders of the Pony Express service carried mail west of the Mississippi River before railroads were built in that part of our country. The Pony Express, which began in 1860, ran between St. Joseph, Missouri, and Sacramento, California. The post rider service between New York and Boston began in 1673. How many years after 1673 did the Pony Express begin?

2. In the Pony Express service the horses ran at full speed. Every 10 mi. the rider changed to a fresh horse. Every 50 mi. there was a new rider. The distance between St. Joseph and Sacramento was 1950 mi. How many different horses and how many different riders were used on a complete western trip from St. Joseph to Sacramento?

3. The trip of 1950 mi. was made in 10 days. How many miles a day were covered on the average? A post rider between Boston and Saybrook made his trip of 117 mi. in 6 days. How many miles a day did he average?

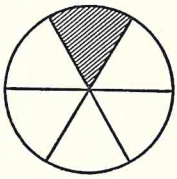
4. Tom says that the Pony Express speed of 195 mi. a day was 10 times as fast as the post rider speed of $19\frac{1}{2}$ mi. a day. See ex. 3. Is Tom right?

5. To send a letter by Pony Express it cost $5.00 for each $\frac{1}{2}$ oz. or less that the letter weighed. What did it cost to send a letter weighing 1 oz.? a letter weighing 2 oz.?



1. This square is divided into 8 equal parts. What part of the whole square is one part? What part of the square is shaded? What part of the square is not shaded?

2. You see that $\frac{3}{8}$ of the square is shaded. A number like $\frac{3}{8}$ is called a fraction. In this fraction 3 is called the *numerator* and 8 is called the *denominator*. The denominator 8 shows that a whole thing, like a square, has been divided into 8 equal parts. The numerator 3 shows that three of these equal parts are to be used. 3 and 8 are also called the *terms* of the fraction.



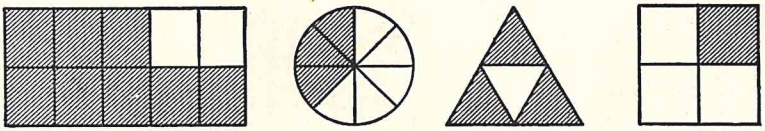
3. This circle is divided into 6 equal parts. What part of the circle is shaded? What part is not shaded? In the fraction $\frac{5}{6}$ what does the 6 mean? What does the 5 mean?

In the following fractions tell what each numerator and each denominator means:

4. $\frac{3}{4}$ of a pound $\frac{1}{2}$ of a yard $\frac{5}{8}$ of a cake

5. $\frac{1}{6}$ of an orange $\frac{3}{8}$ of a yard $\frac{2}{3}$ of a foot

6. Write the two fractions that tell the parts of each figure that are shaded and not shaded:



7. Draw a square and divide it into 16 equal parts. First draw a figure like the last one in ex. 6. Then divide each small square into 4 equal parts. Shade $\frac{5}{16}$ of the figure. What part of the figure is not shaded?

1. Every fraction has a name which is the same as the name of its denominator. Thus, $\frac{5}{8}$ has the name *eighths;* you can also write $\frac{5}{8}$ as 5 *eighths.* Likewise, $\frac{2}{3}$ has the name *thirds;* you can also write $\frac{2}{3}$ as 2 *thirds.* Tell the name of each of these fractions: $\frac{3}{4}$, $\frac{5}{6}$, $\frac{3}{5}$, $\frac{4}{7}$, $\frac{3}{10}$.

2. You can add things only if they have the *same* name. You can add 2 dogs and 3 dogs; the answer is 5 dogs. But if you try to add 2 dogs and 3 cats, you cannot do it; the answer cannot be 5 dogs nor 5 cats.

3. You can add fractions if they have the *same* name. For example, you can add $\frac{2}{5}$ and $\frac{1}{5}$ because they both have the name *fifths.* When you add 2 *fifths* and 1 *fifth,* the sum is 3 *fifths.* You get the answer just as you do when you add 2 *books* and 1 *book.*

Write this:	*Think this:*
$\frac{2}{5}$	2 fifths
$\frac{1}{5}$	1 fifth
$\frac{3}{5}$	3 fifths

4. Joe lives in the country. It is $\frac{1}{3}$ mi. from Joe's house to the store. This morning Joe walked to the store and back. How far did he walk in all?

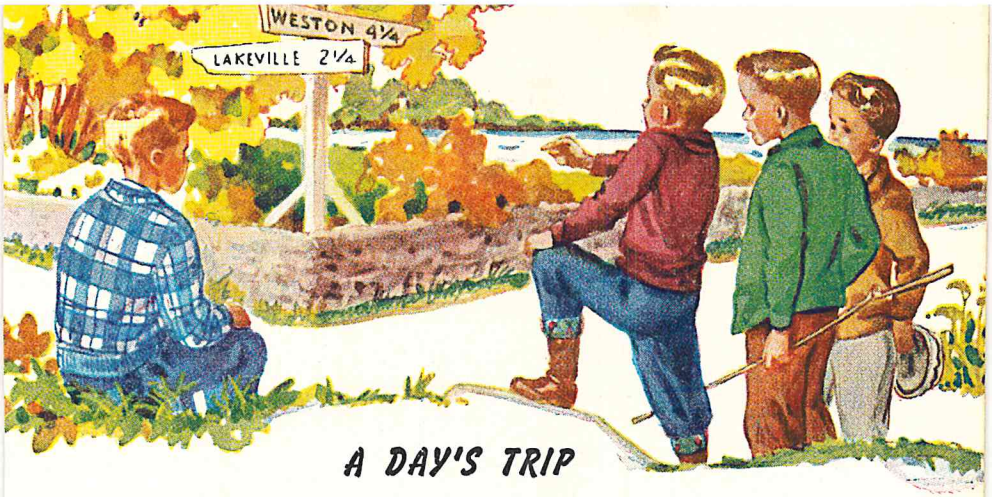
5. In ex. 3 you found that $\frac{2}{5} + \frac{1}{5} = \frac{3}{5}$. The fractions $\frac{2}{5}$ and $\frac{1}{5}$ have the *same name* or the *same denominator;* to add these fractions you added the numerators, 2 and 1. In ex. 4 you found that $\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$. The fractions $\frac{1}{3}$ and $\frac{1}{3}$ have the *same denominator;* to add these fractions you added the numerators.

Add these fractions:

6.

$\frac{2}{4}$	$\frac{2}{5}$	$\frac{1}{7}$	$\frac{1}{8}$	$\frac{3}{6}$	$\frac{6}{8}$	$\frac{3}{10}$	$\frac{5}{16}$
$\frac{1}{4}$	$\frac{2}{5}$	$\frac{3}{7}$	$\frac{4}{8}$	$\frac{2}{6}$	$\frac{1}{8}$	$\frac{4}{10}$	$\frac{4}{16}$

You add fractions having the same denominator by adding the numerators.



A DAY'S TRIP

1. Last Saturday four boys went to Green Lake. They walked $4\frac{1}{4}$ mi. from Weston to Green Lake, $2\frac{1}{4}$ mi. from Green Lake to Lakeville, and $3\frac{1}{4}$ mi. to get back to Weston. How many miles did they walk in all?

Write the numbers in a column. Add the fractions; since the denominators are the same, add the numerators, which gives $\frac{3}{4}$. Then add the other numbers, which gives 9. The answer is $9\frac{3}{4}$. The boys walked $9\frac{3}{4}$ mi. in all.

$$\begin{array}{r} 4\frac{1}{4} \\ 2\frac{1}{4} \\ 3\frac{1}{4} \\ \hline 9\frac{3}{4} \end{array}$$

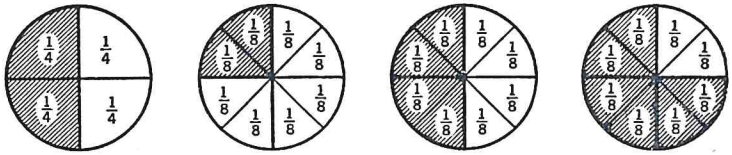
Numbers like 4, 2, and 3 are called *whole numbers*. When a fraction and a whole number are written together, as in $9\frac{3}{4}$, the number is called a *mixed number*.

2. The boys walked $1\frac{1}{4}$ hr. in the morning, stayed at Green Lake for $3\frac{1}{4}$ hr., and walked $2\frac{1}{4}$ hr. in the afternoon. How many hours were they away?

Add these mixed numbers:

3. $3\frac{1}{3}$	$2\frac{1}{5}$	$4\frac{3}{8}$	$6\frac{1}{4}$	$1\frac{2}{8}$	$7\frac{2}{5}$	$3\frac{2}{16}$
$5\frac{1}{3}$	$1\frac{3}{5}$	$3\frac{4}{8}$	$4\frac{2}{4}$	$8\frac{3}{8}$	$3\frac{2}{5}$	$2\frac{3}{16}$
4. $2\frac{1}{6}$	$1\frac{3}{8}$	$6\frac{2}{7}$	$4\frac{1}{8}$	$2\frac{1}{5}$	$1\frac{3}{8}$	$2\frac{1}{12}$
$2\frac{3}{6}$	$4\frac{1}{8}$	$3\frac{1}{7}$	$2\frac{1}{8}$	$1\frac{2}{5}$	$3\frac{3}{8}$	$6\frac{5}{12}$
$3\frac{1}{6}$	$2\frac{1}{8}$	$2\frac{3}{7}$	$4\frac{1}{8}$	$1\frac{1}{5}$	$4\frac{1}{8}$	$3\frac{1}{12}$

Adding like fractions.



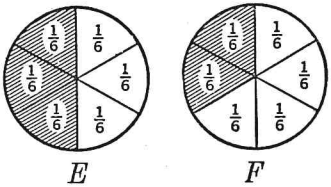
1. Circle A is divided into *fourths*. You see that $\frac{1}{2}$ of circle A is shaded. How many fourths of the circle are shaded? How many fourths of a circle make $\frac{1}{2}$ of a circle? Does $\frac{2}{4} = \frac{1}{2}$? Does $\frac{1}{2} = \frac{2}{4}$?

2. Circle B is divided into eighths. How many eighths of a circle make $\frac{1}{4}$ of a circle? Does $\frac{2}{8} = \frac{1}{4}$? Does $\frac{1}{4} = \frac{2}{8}$?

3. In circle C, how many eighths of a circle make $\frac{1}{2}$ of a circle? Does $\frac{4}{8} = \frac{1}{2}$? Does $\frac{1}{2} = \frac{4}{8}$?

4. In circle D, how many eighths of a circle make $\frac{3}{4}$ of a circle? Does $\frac{6}{8} = \frac{3}{4}$? Does $\frac{3}{4} = \frac{6}{8}$?

5. Circle E at the right is divided into sixths; $\frac{1}{2}$ of the circle is shaded. Show that $\frac{1}{2} = \frac{3}{6}$ and that $\frac{3}{6} = \frac{1}{2}$. In circle F what part of the circle is shaded? Show that $\frac{1}{3} = \frac{2}{6}$ and that $\frac{2}{3} = \frac{4}{6}$.



6. Fractions like $\frac{1}{2}$ and $\frac{4}{8}$ are called *equal* fractions because $\frac{1}{2} = \frac{4}{8}$. Equal fractions also have the *same value;* thus $\frac{1}{2}$ has the same value as $\frac{4}{8}$. In ex. 1 to 5, pick out 6 other pairs of equal fractions.

7. In working problems, it sometimes helps to change a fraction to another fraction that is equal to it. For example, if a problem has an answer of $\frac{4}{8}$, you may change $\frac{4}{8}$ to $\frac{1}{2}$.

8. Draw a large circle on a sheet of paper. Divide it into 12 equal parts as carefully as you can. What part of the circle is each part? Shade 8 parts of the circle. Show that $\frac{8}{12} = \frac{2}{3}$ and that $\frac{4}{12} = \frac{1}{3}$.

1. On page 80 you learned that $\frac{2}{4}$ and $\frac{1}{2}$ have the same value. An easy way to change $\frac{2}{4}$ to $\frac{1}{2}$ is to divide both terms of $\frac{2}{4}$ by 2, as shown in *A*.

A. $\frac{2 \div 2}{4 \div 2} = \frac{1}{2}$ *B.* $\frac{2 \div 2}{8 \div 2} = \frac{1}{4}$ *C.* $\frac{8 \div 8}{16 \div 8} = \frac{1}{2}$

2. You can change $\frac{2}{8}$ to $\frac{1}{4}$ by dividing both terms by 2, as shown in *B*. You can change $\frac{8}{16}$ to $\frac{1}{2}$ by dividing both terms by 8, as shown in *C*.

3. What fraction do you get when you divide both terms of $\frac{6}{8}$ by 2? Does $\frac{6}{8} = \frac{3}{4}$?

> If you divide both terms of a fraction by the same number, you get another fraction having the same value.

4. When you change $\frac{4}{8}$ to $\frac{1}{2}$ by dividing both 4 and 8 by 4, you reduce $\frac{4}{8}$ to *lowest terms*, because you divide both 4 and 8 by the *largest* number that will divide each exactly. You could also change $\frac{4}{8}$ to $\frac{2}{4}$ by dividing both 4 and 8 by 2; in this case $\frac{4}{8}$ would not be reduced to lowest terms because you could further reduce $\frac{2}{4}$ to $\frac{1}{2}$.

5. If you divide both terms of $\frac{8}{12}$ by 2, will $\frac{8}{12}$ be reduced to lowest terms? If not, how can you reduce $\frac{8}{12}$ to lowest terms?

Reduce each of these fractions to lowest terms:

6.	$\frac{6}{8}$	$\frac{2}{4}$	$\frac{4}{16}$	$\frac{4}{6}$	$\frac{6}{12}$	$\frac{6}{16}$	$\frac{9}{12}$	$\frac{12}{16}$
7.	$\frac{3}{6}$	$\frac{4}{8}$	$\frac{3}{12}$	$\frac{3}{9}$	$\frac{2}{16}$	$\frac{5}{20}$	$\frac{8}{12}$	$\frac{10}{12}$
8.	$\frac{6}{9}$	$\frac{2}{6}$	$\frac{5}{10}$	$\frac{3}{15}$	$\frac{5}{15}$	$\frac{4}{12}$	$\frac{8}{10}$	$\frac{14}{16}$
9.	$\frac{8}{8}$	$\frac{6}{6}$	$\frac{8}{16}$	$\frac{10}{15}$	$\frac{2}{12}$	$\frac{10}{20}$	$\frac{12}{12}$	$\frac{10}{16}$
10.	$\frac{2}{8}$	$\frac{4}{4}$	$\frac{4}{10}$	$\frac{15}{20}$	$\frac{16}{16}$	$\frac{16}{20}$	$\frac{6}{10}$	$\frac{4}{20}$

1. Bill, Ann, and Mary live in the country. It is $2\frac{1}{4}$ mi. from their house to the school. They ride to school in the morning and back home in the afternoon after school is out. How many miles do they ride each day?

To add $2\frac{1}{4}$ and $2\frac{1}{4}$ write the numbers in a column as shown at the right. Think "$\frac{1}{4} + \frac{1}{4} = \frac{2}{4}$." Write $\frac{2}{4}$ under the line. Then think "$2 + 2 = 4$." Write 4 under the line. The sum is $4\frac{2}{4}$. Reducing $\frac{2}{4}$ to $\frac{1}{2}$, you get $4\frac{1}{2}$ as the answer. The children ride $4\frac{1}{2}$ mi. each day.

$$\begin{array}{r} 2\frac{1}{4} \\ 2\frac{1}{4} \\ \hline 4\frac{2}{4} \end{array} = 4\frac{1}{2}$$

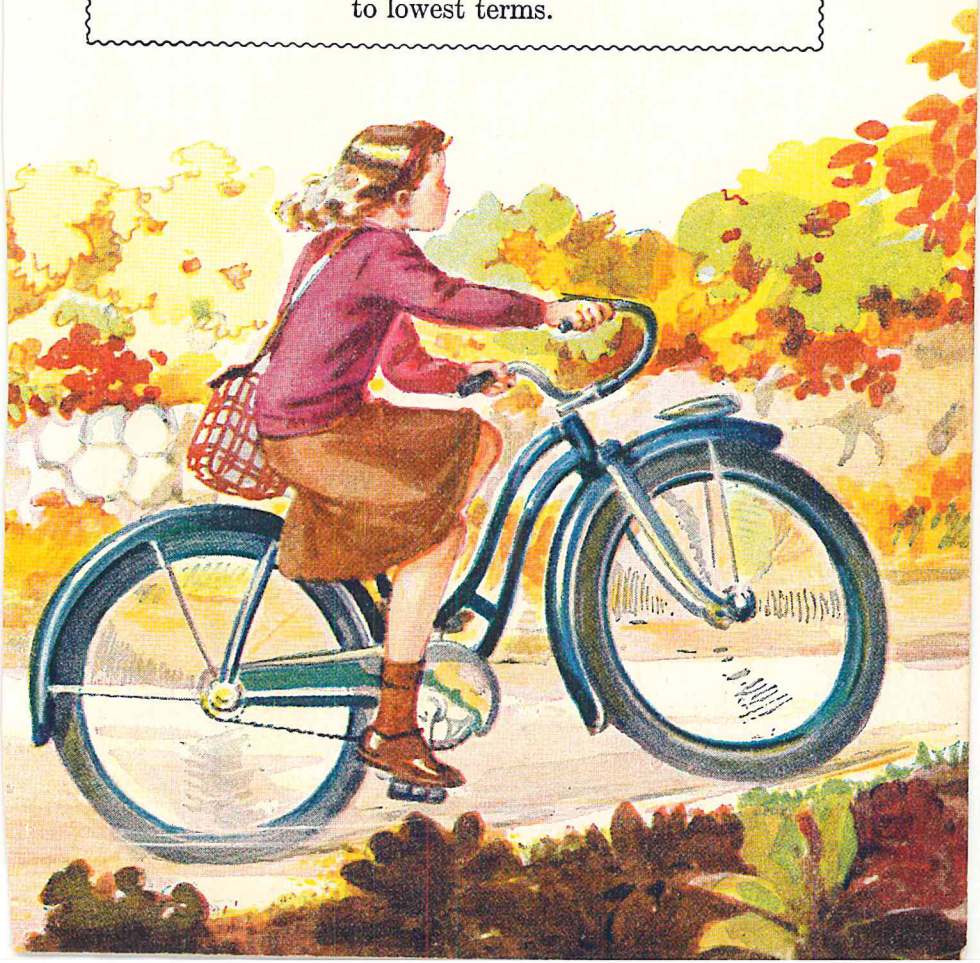
2. Jack goes to high school. It is $3\frac{1}{4}$ mi. from his house to the high school. How many miles does Jack have to ride to get to the high school and back each day?

3. Tom can ride from his house to the high school on his bicycle in $\frac{1}{4}$ hr. He can ride back home again in the same time. How long does it take him to ride to high school and back each day?

Add. Reduce fractions in sums to lowest terms:

4.	$\frac{1}{8}$	$\frac{5}{16}$	$2\frac{1}{6}$	$1\frac{3}{10}$	$4\frac{1}{12}$	$5\frac{7}{16}$	$3\frac{1}{16}$
	$\frac{1}{8}$	$\frac{1}{16}$	$4\frac{1}{6}$	$1\frac{3}{10}$	$3\frac{5}{12}$	$2\frac{3}{16}$	$3\frac{1}{16}$
5.	$\frac{3}{8}$	$\frac{3}{10}$	$3\frac{1}{4}$	$7\frac{3}{16}$	$2\frac{1}{10}$	$4\frac{5}{16}$	$1\frac{7}{12}$
	$\frac{1}{8}$	$\frac{1}{10}$	4	$2\frac{5}{16}$	$2\frac{7}{10}$	$4\frac{7}{16}$	$6\frac{1}{12}$
6.	$\frac{1}{6}$	$\frac{1}{12}$	$4\frac{1}{9}$	2	$1\frac{1}{10}$	$3\frac{1}{6}$	$2\frac{1}{12}$
	$\frac{1}{6}$	$\frac{1}{12}$	$2\frac{1}{9}$	$1\frac{1}{12}$	$1\frac{3}{10}$	4	$2\frac{1}{12}$
	$\frac{1}{6}$	$\frac{7}{12}$	$8\frac{1}{9}$	$3\frac{1}{12}$	$4\frac{1}{10}$	$7\frac{1}{6}$	$3\frac{1}{12}$

Always reduce the fraction in an answer to lowest terms.



1. You can subtract fractions that have the same denominator just as you can add fractions that have the same denominator. For example, 2 *thirds* less 1 *third* is 1 *third*, or $\frac{2}{3} - \frac{1}{3} = \frac{1}{3}$.

2. Mary had $\frac{3}{4}$ hr. to go roller skating after school. She spent $\frac{1}{4}$ hr. looking for her skate key. How much time did she have left to skate?

Write $\frac{1}{4}$ under $\frac{3}{4}$. Since both fractions have the same denominator, you can subtract $\frac{1}{4}$ from $\frac{3}{4}$, which leaves $\frac{2}{4}$. The answer is $\frac{2}{4}$, which can be reduced to $\frac{1}{2}$. Mary had $\frac{1}{2}$ hr. to skate.

3 fourths $= \frac{3}{4}$
1 fourth $= \frac{1}{4}$
2 fourths $= \frac{2}{4}$ or $\frac{1}{2}$

3. Betty has two pieces of cloth. The blue cloth is $\frac{7}{8}$ yd. long and the red cloth is $\frac{5}{8}$ yd. long. How much more blue cloth has Betty than red cloth?

4. The post office is $\frac{5}{8}$ mi. from Tom's house. The library is $\frac{3}{8}$ mi. from his house. How much farther from Tom's house is the post office than the library?

5. Ann bought $\frac{7}{8}$ yd. of green ribbon and $\frac{3}{8}$ yd. of white ribbon. Find the difference in the lengths of the pieces.

Subtract. Reduce fractions in answers to lowest terms:

6.	$\frac{2}{3}$	$\frac{5}{8}$	$\frac{9}{10}$	$\frac{4}{5}$	$\frac{15}{16}$	$\frac{7}{12}$	$\frac{7}{10}$
	$\frac{1}{3}$	$\frac{1}{8}$	$\frac{1}{10}$	$\frac{1}{5}$	$\frac{9}{16}$	$\frac{1}{12}$	$\frac{3}{10}$
7.	$\frac{5}{6}$	$\frac{3}{4}$	$\frac{5}{16}$	$\frac{3}{6}$	$\frac{8}{10}$	$\frac{9}{16}$	$\frac{7}{12}$
	$\frac{1}{6}$	$\frac{1}{4}$	$\frac{3}{16}$	$\frac{2}{6}$	$\frac{5}{10}$	$\frac{7}{16}$	$\frac{3}{12}$
8.	$\frac{8}{9}$	$\frac{5}{6}$	$\frac{11}{12}$	$\frac{1}{2}$	$\frac{11}{16}$	$\frac{3}{10}$	$\frac{6}{12}$
	$\frac{5}{9}$	$\frac{2}{6}$	$\frac{5}{12}$	$\frac{1}{2}$	$\frac{5}{16}$	$\frac{1}{10}$	$\frac{1}{12}$
9.	$\frac{6}{8}$	$\frac{5}{5}$	$\frac{3}{10}$	$\frac{3}{8}$	$\frac{10}{12}$	$\frac{13}{16}$	$\frac{9}{10}$
	$\frac{3}{8}$	$\frac{3}{5}$	$\frac{3}{10}$	$\frac{1}{8}$	$\frac{6}{12}$	$\frac{5}{16}$	$\frac{4}{10}$

1. Jack can run the length of the school playground in $10\frac{4}{5}$ sec. Ned can run the same distance in $10\frac{1}{5}$ sec. How much less time does Ned take than Jack?

2. Mary looked at patterns for a new dress that her mother will make for her. One pattern used $2\frac{5}{8}$ yd. of cloth and another used $2\frac{1}{8}$ yd. How much more cloth did one pattern use than the other?

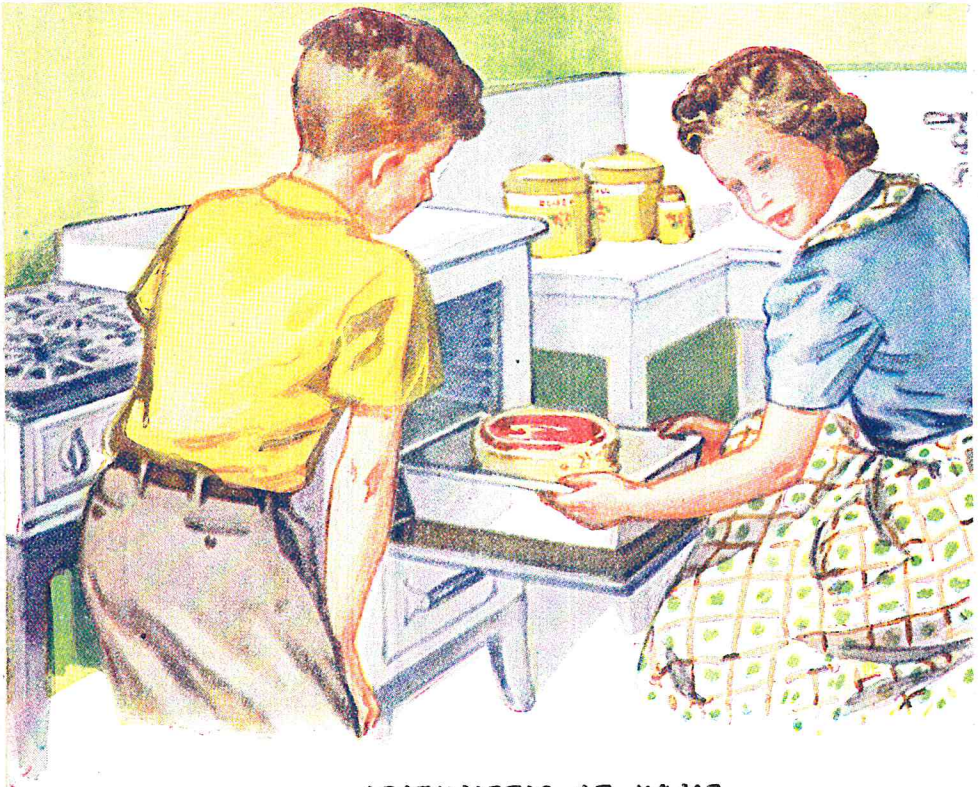
3. Alice weighed $76\frac{1}{4}$ lb. last spring. Now she weighs $79\frac{3}{4}$ lb. How many pounds has Alice gained?

4. Bill had a hen that weighed $5\frac{5}{8}$ lb. When it was ready to cook it weighed $4\frac{3}{8}$ lb. How much weight was lost?

5. Mrs. Smith mailed a box of candy to Henry. When it was wrapped, it weighed $2\frac{3}{4}$ lb. The candy alone weighed $2\frac{1}{4}$ lb. What was the weight of the box, paper, and string?

Subtract. Reduce fractions in answers to lowest terms:

6.	$8\frac{7}{8}$	$8\frac{5}{6}$	$2\frac{9}{16}$	$8\frac{11}{12}$	$3\frac{2}{5}$	$86\frac{1}{2}$	$25\frac{3}{4}$
	$6\frac{1}{8}$	$7\frac{1}{6}$	$2\frac{1}{16}$	$2\frac{5}{12}$	2	$12\frac{1}{2}$	$10\frac{1}{4}$
7.	$9\frac{2}{3}$	$6\frac{3}{5}$	$4\frac{3}{10}$	$5\frac{6}{16}$	$6\frac{5}{6}$	$79\frac{5}{8}$	$36\frac{2}{3}$
	$5\frac{1}{3}$	$3\frac{2}{5}$	$1\frac{1}{10}$	$5\frac{1}{16}$	$4\frac{3}{6}$	$29\frac{1}{8}$	$15\frac{2}{3}$
8.	$7\frac{3}{4}$	$5\frac{5}{8}$	$8\frac{5}{12}$	$9\frac{9}{10}$	$6\frac{7}{8}$	$68\frac{4}{5}$	$49\frac{7}{8}$
	$2\frac{2}{4}$	$1\frac{3}{8}$	$4\frac{1}{12}$	$3\frac{3}{10}$	$6\frac{3}{8}$	31	$18\frac{1}{8}$
9.	$8\frac{7}{8}$	$9\frac{2}{4}$	$7\frac{3}{12}$	$6\frac{9}{10}$	$5\frac{4}{5}$	$12\frac{1}{3}$	$20\frac{5}{8}$
	$5\frac{5}{8}$	$4\frac{1}{4}$	$4\frac{1}{12}$	$2\frac{7}{10}$	$3\frac{3}{5}$	$10\frac{1}{3}$	$9\frac{3}{8}$
10.	$9\frac{4}{5}$	$7\frac{5}{6}$	$8\frac{5}{16}$	$9\frac{11}{12}$	$7\frac{6}{8}$	$40\frac{7}{8}$	$18\frac{2}{4}$
	$2\frac{2}{5}$	$\frac{4}{6}$	$3\frac{1}{16}$	$1\frac{7}{12}$	$5\frac{1}{8}$	$25\frac{6}{8}$	$13\frac{1}{4}$
11.	$3\frac{1}{2}$	$1\frac{2}{5}$	$6\frac{7}{10}$	$8\frac{11}{16}$	$5\frac{5}{6}$	$38\frac{6}{8}$	$12\frac{4}{5}$
	$1\frac{1}{2}$	$1\frac{1}{5}$	$2\frac{3}{10}$	$4\frac{5}{16}$	$3\frac{1}{6}$	$15\frac{3}{8}$	$9\frac{1}{5}$



ARITHMETIC AT HOME

The pupils in Miss Lane's class have tried to find out how much arithmetic is used at home. In one day Mary and Joe found these problems at home:

1. Mother has a 6-pound roast which she wants to cook for dinner at 6 o'clock. The time she allows for cooking it is 25 min. to each pound of meat. How many hours should she allow for this roast? At what time should she put the roast in the oven in order to have it ready by 6 o'clock?

2. Mother allows 1 hr. for the baked potatoes. How long after she starts roasting the meat should she put the potatoes in the oven? At what time should she do this?

3. Mother received the week's milk bill today. It is $4.48 and she wants to check it. She had used 4 qt. of milk each day of the week at $.16 a quart. Is the bill correct?

4. Joe works after school for Mr. Smith. Today he was paid for the week and got \$.30 an hour. He had worked $1\frac{1}{4}$ hr. on Monday, $1\frac{1}{4}$ hr. on Tuesday, 1 hr. on Wednesday, 1 hr. on Thursday, and 2 hr. on Friday. How much was Joe paid all together?

5. Father raises chickens and sometimes he sells them. Today he sold Mrs. Cox one chicken that weighed $4\frac{1}{4}$ lb. and another that weighed $3\frac{1}{4}$ lb. How much did he get for both chickens at \$.44 a pound?

6. Mother has a piece of cloth $5\frac{3}{4}$ yd. long. Has she enough cloth to make a dress for Mary that requires $3\frac{1}{4}$ yd. and a skirt for herself that requires $2\frac{1}{4}$ yd.?

7. Mary's music teacher wants her to practice $4\frac{1}{2}$ hr. a week. Mary has practiced $3\frac{1}{2}$ hr. so far this week. How many more hours does she need to practice?

Add up. Check the work by adding down:

1.	74	37	46	54	93	54	77	37
	57	50	35	46	88	33	22	91
	46	98	57	88	45	96	61	52
	79	65	78	65	79	28	98	70
	63	49	33	89	25	19	16	68
	25	16	63	17	14	23	54	19

Subtract. Check the work by adding:

2.	5731	4956	8140	4152	3763
	1642	3592	3685	1413	2586
3.	7002	6017	8409	8925	9737
	4686	2258	4542	3474	6841

Multiply. Check the work by going over it:

4.	6×2049	134×458	$18 \times \$15.97$
5.	8×3486	372×386	$47 \times \$32.49$
6.	5×1968	263×638	$76 \times \$10.75$
7.	9×1439	459×527	$85 \times \$24.39$
8.	4×4307	628×912	$29 \times \$13.38$
9.	7×2450	579×703	$63 \times \$25.50$

Divide. Check the work by multiplying:

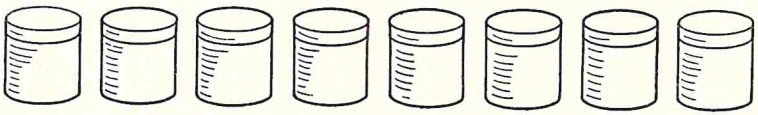
10.	$4\overline{)347}$	$6\overline{)145}$	$4\overline{)569}$	$5\overline{)1288}$	$9\overline{)1287}$
11.	$3\overline{)226}$	$7\overline{)350}$	$5\overline{)739}$	$8\overline{)1304}$	$4\overline{)2957}$
12.	$5\overline{)283}$	$9\overline{)288}$	$7\overline{)826}$	$6\overline{)2047}$	$8\overline{)1976}$
13.	$2\overline{)197}$	$8\overline{)433}$	$9\overline{)945}$	$7\overline{)1838}$	$6\overline{)4591}$

1. Remember this table of liquid measure:

2 pints (pt.) = 1 quart (qt.)
4 quarts (qt.) = 1 gallon (gal.)

2. How many pints are there in 1 qt.? How many pints are there in 4 qt.? Then how many pints are there in 1 gal.?

3. Here are 8 pint boxes of ice cream. Together they make 1 gal. of ice cream.



What part of 1 gal. is 1 pt.? Since the gallon is divided into 8 pt., you see that 1 pt. is $\frac{1}{8}$ gal. You know that the denominator of a fraction tells how many equal parts there are and that the numerator tells how many of these parts you are using.

4. Look at the row of 8 pint boxes above and tell what part of a gallon 3 pt. are. What part of a gallon is 5 pt.? 7 pt.?

5. What part of a gallon is 2 pt.? Reduce the answer to lowest terms.

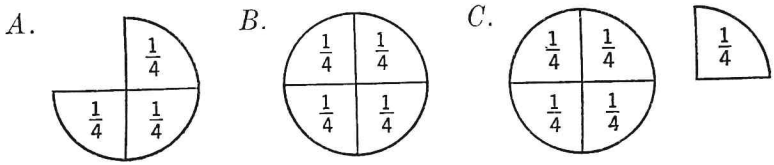
6. What part of a gallon is 4 pt.? What part of a gallon is 6 pt.? Reduce the answers to lowest terms.

7. What part of a gallon is 1 qt.? What part of a gallon is 2 qt.? 3 qt.?

Tell what numbers to put in the spaces:

8. 1 qt. = . . . gal.	2 qt. = . . . gal.	3 qt. = . . . pt.
9. 1 pt. = . . . qt.	2 gal. = . . . qt.	3 qt. = . . . gal.
10. 1 qt. = . . . pt.	3 gal. = . . . pt.	6 pt. = . . . qt.

1. A whole thing like a whole circle is 1 *unit*, or 1. You see that Fig. *A* is less than 1 whole circle; it is only $\frac{3}{4}$ of a circle. The fraction $\frac{3}{4}$ is less than 1. The numerator of $\frac{3}{4}$ is *smaller* than its denominator.



$\frac{3}{4}$ is less than 1. $\frac{4}{4}$ equals 1. $\frac{5}{4}$ is more than 1.

2. Fig. *B* is 1 whole circle. It is divided into 4 fourths. You know that $\frac{4}{4} = 1$. In the fraction $\frac{4}{4}$, the numerator is *equal* to the denominator.

3. Fig. *C* shows a whole circle and $\frac{1}{4}$ of another circle, or $\frac{5}{4}$ of a circle in all. You see that $\frac{5}{4}$ is more than 1. In the fraction $\frac{5}{4}$, the numerator is *larger* than the denominator.

4. Draw a line $\frac{7}{8}$ in. long. Draw another line $\frac{9}{8}$ in. long. Which line is smaller than 1 in.? Which is larger than 1 in.?

5. Fractions like $\frac{3}{4}$, $\frac{7}{8}$, and $\frac{9}{16}$, in which the numerator is *smaller* than the denominator, are called *proper fractions*. A proper fraction is always smaller than 1.

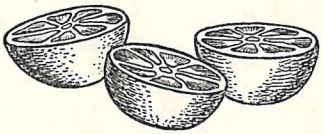
6. Fractions like $\frac{4}{4}$, $\frac{8}{8}$, $\frac{5}{4}$, and $\frac{9}{8}$, in which the numerator is *equal* to or *larger* than the denominator, are called *improper fractions*. Improper fractions like $\frac{4}{4}$, $\frac{6}{6}$, and $\frac{8}{8}$ equal 1; in these fractions the numerator equals the denominator. Improper fractions like $\frac{5}{4}$, $\frac{9}{8}$, $\frac{19}{16}$ are larger than 1; in these fractions the numerator is larger than the denominator.

7. Tell why $\frac{5}{16}$ is a proper fraction. Tell why $\frac{27}{16}$ is an improper fraction.

8. Tell which are proper and which are improper fractions:

$\frac{4}{3}$ $\frac{5}{8}$ $\frac{3}{3}$ $\frac{9}{8}$ $\frac{7}{8}$ $\frac{5}{6}$ $\frac{8}{6}$ $\frac{6}{6}$ $\frac{5}{12}$ $\frac{12}{12}$

1. Mary prepares 3 halves of grapefruit for breakfast.



The 3 halves of grapefruit make 1 whole grapefruit and $\frac{1}{2}$ of another grapefruit, or $1\frac{1}{2}$ grapefruit. $\frac{3}{2} = 1\frac{1}{2}$.

2. You know that $\frac{3}{2}$ means $3 \div 2$. You can find that $\frac{3}{2} = 1\frac{1}{2}$ by dividing the numerator 3 by the denominator 2 and writing the remainder as a fraction in the quotient.

$$\begin{array}{r} 1\frac{1}{2} \\ 2\overline{)3} \\ \underline{2} \\ 1 \end{array}$$

3. The girls in the sewing class are dressing 10 dolls. They need $\frac{1}{3}$ yd. of ribbon for each doll. For the 10 dolls they will need $\frac{10}{3}$ yd. of ribbon. Divide 10 by 3 and show that $\frac{10}{3}$ yd. $= 3\frac{1}{3}$ yd.

4. Show by dividing that these are true:

$\frac{7}{4} = 1\frac{3}{4}$ $\quad \frac{6}{4} = 1\frac{2}{4} = 1\frac{1}{2}$ $\quad \frac{12}{4} = 3$ $\quad \frac{20}{8} = 2\frac{4}{8} = 2\frac{1}{2}$

5. A number like 1, 3, or 6 is a *whole number*. A number like $1\frac{1}{2}$, $3\frac{1}{3}$, or $2\frac{3}{4}$ is a *mixed number;* a mixed number is made up of a whole number and a fraction.

Change to whole numbers or mixed numbers. Reduce fractions in mixed numbers to lowest terms:

6.	$\frac{7}{3}$	$\frac{6}{6}$	$\frac{13}{8}$	$\frac{10}{5}$	$\frac{12}{8}$	$\frac{16}{3}$	$\frac{50}{5}$	$\frac{9}{6}$
7.	$\frac{9}{3}$	$\frac{5}{2}$	$\frac{11}{4}$	$\frac{15}{2}$	$\frac{18}{4}$	$\frac{21}{2}$	$\frac{24}{24}$	$\frac{8}{4}$
8.	$\frac{8}{2}$	$\frac{3}{3}$	$\frac{16}{8}$	$\frac{23}{4}$	$\frac{16}{5}$	$\frac{36}{9}$	$\frac{20}{12}$	$\frac{9}{8}$
9.	$\frac{6}{5}$	$\frac{8}{6}$	$\frac{15}{4}$	$\frac{22}{8}$	$\frac{26}{8}$	$\frac{24}{3}$	$\frac{16}{14}$	$\frac{4}{3}$
10.	$\frac{8}{5}$	$\frac{9}{4}$	$\frac{31}{4}$	$\frac{15}{6}$	$\frac{23}{5}$	$\frac{16}{6}$	$\frac{32}{8}$	$\frac{7}{5}$
11.	$\frac{5}{3}$	$\frac{7}{6}$	$\frac{11}{8}$	$\frac{20}{6}$	$\frac{15}{8}$	$\frac{30}{4}$	$\frac{14}{14}$	$\frac{5}{4}$

To change an improper fraction to a whole number or to a mixed number, divide its numerator by its denominator.

A TRIP TO THE FARM

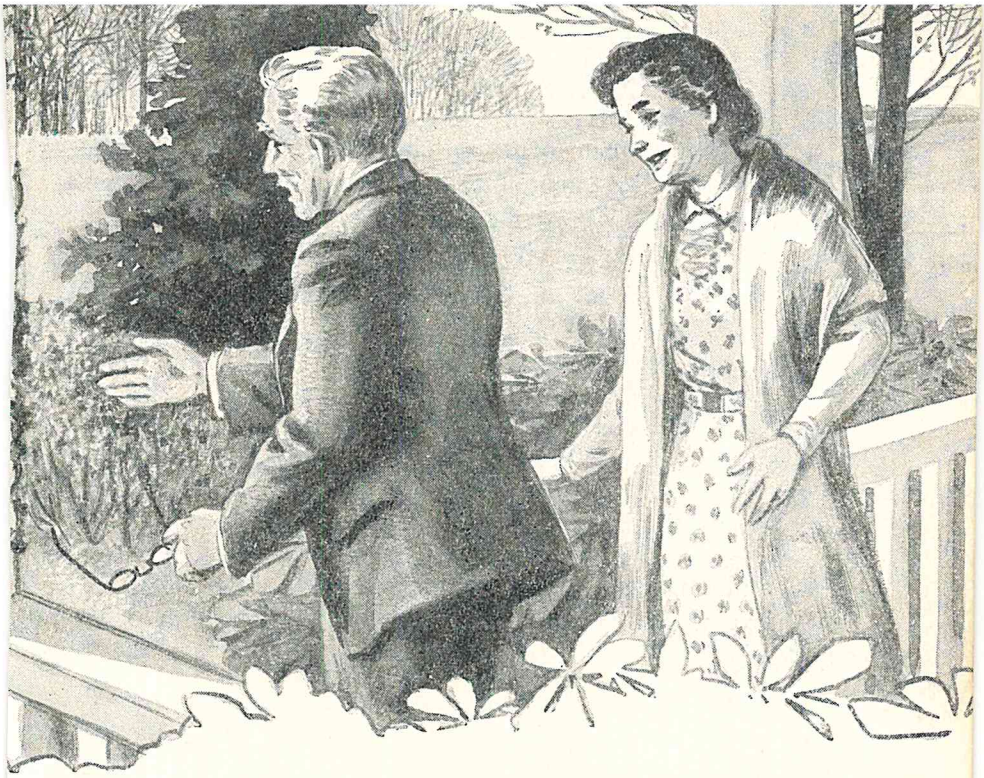
1. Fred and Henry went to visit their grandparents during Thanksgiving vacation. They rode on a bus for $2\frac{3}{4}$ hr., waited in the station for $\frac{3}{4}$ hr., and rode on the train for $1\frac{1}{4}$ hr. How long did the whole trip take?

You must add three numbers to find the answer. Study the work at the right. You see that the sum of the fractions is $\frac{7}{4}$, which is an improper fraction. Change $\frac{7}{4}$ to the mixed number $1\frac{3}{4}$ and add it to 3. The answer is $4\frac{3}{4}$. The whole trip took $4\frac{3}{4}$ hr.

$$\begin{array}{r} 2\frac{3}{4} \\ \frac{3}{4} \\ 1\frac{1}{4} \\ \hline 3\frac{7}{4} = 4\frac{3}{4} \end{array}$$

2. For Thanksgiving dinner, Grandmother cooked a turkey that weighed $15\frac{3}{4}$ lb. Grandfather said the turkey they ate last Thanksgiving weighed $3\frac{1}{4}$ lb. more than this year's turkey. How many pounds did that turkey weigh?

3. When the boys went home their grandfather saved them the trip on the train by driving them all the way to the bus. The trip with Grandfather took $1\frac{1}{4}$ hr. Then they rode on the bus for $2\frac{3}{4}$ hr. How long did the whole trip take?



4. Explain each step in these examples in addition:

$$\begin{array}{r} \frac{4}{5} \\ \frac{3}{5} \\ \hline \frac{7}{5} \end{array} = 1\tfrac{2}{5} \qquad \begin{array}{r} 5\frac{3}{8} \\ 6\frac{5}{8} \\ \hline 11\frac{8}{8} \end{array} = 12 \qquad \begin{array}{r} 2\frac{15}{16} \\ 3\frac{4}{16} \\ \hline 5\frac{19}{16} \end{array} = 6\tfrac{3}{16}$$

Add. Check the work by going over it:

5.
$$\begin{array}{r} \frac{4}{5} \\ \frac{4}{5} \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{2} \\ \frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} \frac{11}{16} \\ 2\frac{5}{16} \\ \hline \end{array} \quad \begin{array}{r} 4\frac{5}{8} \\ \frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{4}{7} \\ 5\frac{6}{7} \\ \hline \end{array} \quad \begin{array}{r} 4\frac{13}{16} \\ 4\frac{3}{16} \\ \hline \end{array} \quad \begin{array}{r} 5\frac{5}{6} \\ 3\frac{2}{6} \\ \hline \end{array}$$

6.
$$\begin{array}{r} \frac{7}{8} \\ \frac{4}{8} \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{4} \\ \frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{7}{12} \\ 4\frac{6}{12} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{1}{3} \\ 1\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{3}{4} \\ 4\frac{2}{4} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{9}{10} \\ 7\frac{4}{10} \\ \hline \end{array} \quad \begin{array}{r} 1\frac{7}{8} \\ 1\frac{6}{8} \\ \hline \end{array}$$

7.
$$\begin{array}{r} \frac{1}{6} \\ \frac{5}{6} \\ \frac{5}{6} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{8} \\ \frac{7}{8} \\ \frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{9}{10} \\ 2\frac{7}{10} \\ 3\frac{1}{10} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{3}{5} \\ 2\frac{4}{5} \\ 2\frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{2}{3} \\ 3 \\ 2\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{7}{12} \\ \frac{5}{12} \\ 1\frac{5}{12} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{5}{8} \\ 2\frac{5}{8} \\ 4\frac{5}{8} \\ \hline \end{array}$$

1. Alice lives on a farm and shops by mail. When Alice ordered her Christmas gifts she looked up the shipping weights in the mail-order catalog in order to send the right amount for postage. The articles she ordered had shipping weights of $3\frac{3}{8}$ lb., $2\frac{7}{8}$ lb., and 2 lb. Find the total shipping weight of the articles that Alice ordered.

When you add the fractions you get $\frac{10}{8}$, which equals $1\frac{2}{8}$. Add $1\frac{2}{8}$ to 7, which gives $8\frac{2}{8}$. Then reduce $\frac{2}{8}$ to $\frac{1}{4}$. The answer is $8\frac{1}{4}$. Alice ordered articles with a total shipping weight of $8\frac{1}{4}$ lb.

$$\begin{array}{r} 3\frac{3}{8} \\ 2\frac{7}{8} \\ 2 \\ \hline 7\frac{10}{8} \end{array} = 7 + 1\frac{2}{8} = 8\frac{2}{8} = 8\frac{1}{4}$$

2. William ordered some Christmas gifts by mail. He found their shipping weights were as follows: $\frac{15}{16}$ lb., $\frac{3}{16}$ lb., and $1\frac{6}{16}$ lb. Find the total shipping weight.

3. Find the total shipping weight of articles with these weights: $1\frac{3}{4}$ lb., 3 lb., $2\frac{3}{4}$ lb. Also find the shipping weight of articles having these weights: $1\frac{3}{16}$ lb., $4\frac{11}{16}$ lb., $2\frac{8}{16}$ lb.

Add. Reduce fractions in sums to lowest terms:

4.	$\frac{5}{6}$	$\frac{7}{8}$	$5\frac{3}{10}$	$6\frac{5}{16}$	$2\frac{11}{12}$	$2\frac{7}{8}$	$\frac{9}{10}$
	$\frac{5}{6}$	$\frac{3}{8}$	$8\frac{9}{10}$	$3\frac{15}{16}$	$6\frac{11}{12}$	$2\frac{5}{8}$	$5\frac{9}{10}$
5.	$\frac{3}{4}$	$\frac{5}{8}$	$2\frac{9}{16}$	$2\frac{7}{12}$	$4\frac{7}{10}$	$3\frac{3}{4}$	$7\frac{9}{16}$
	$\frac{3}{4}$	$\frac{5}{8}$	$2\frac{9}{16}$	$7\frac{11}{12}$	$\frac{9}{10}$	$8\frac{3}{4}$	$2\frac{11}{16}$
6.	$\frac{5}{6}$	$\frac{1}{8}$	$3\frac{7}{12}$	$4\frac{3}{10}$	$1\frac{5}{12}$	$5\frac{5}{8}$	$2\frac{6}{16}$
	$\frac{5}{6}$	$\frac{6}{8}$	$\frac{7}{12}$	$2\frac{9}{10}$	$3\frac{5}{12}$	$\frac{5}{8}$	$3\frac{3}{16}$
	$\frac{5}{6}$	$\frac{3}{8}$	$2\frac{7}{12}$	$3\frac{6}{10}$	$4\frac{5}{12}$	$1\frac{4}{8}$	$\frac{9}{16}$
7.	$\frac{3}{8}$	$\frac{1}{8}$	$4\frac{3}{10}$	$1\frac{7}{16}$	$3\frac{9}{10}$	$2\frac{5}{6}$	$1\frac{11}{12}$
	$\frac{7}{8}$	$\frac{4}{8}$	$1\frac{7}{10}$	$5\frac{4}{16}$	$3\frac{2}{10}$	$7\frac{4}{6}$	$1\frac{11}{12}$
	$\frac{4}{8}$	$\frac{5}{8}$	$6\frac{2}{10}$	$2\frac{7}{16}$	$5\frac{7}{10}$	$\frac{5}{6}$	$2\frac{11}{12}$

1. Bill's father drove to Omaha yesterday. The trip took $2\frac{3}{4}$ hr. including a stop of $\frac{3}{4}$ hr. for lunch. How many hours did he drive?

2. Mrs. Brown bought $4\frac{1}{4}$ yd. of cloth for a dress for herself. Then she decided to use it for dresses for Mary and Betty. The two dresses could be made from $5\frac{3}{4}$ yd. How much more cloth did Mary's mother need to buy?

3. Jack and Ann were measured at school. Jack is $62\frac{3}{4}$ in. tall and Ann is $58\frac{1}{4}$ in. tall. How many inches taller is Jack than Ann?

4. Ann weighed $60\frac{1}{2}$ lb. in June. Now she weighs $63\frac{1}{2}$ lb. How many pounds has Ann gained?

5. In a running race Jack's time was $8\frac{3}{10}$ sec. and Fred's was $8\frac{7}{10}$ sec. How much better was Jack's time than Fred's?

Subtract. Check the work by going over it:

6.	$\frac{11}{16}$	$\frac{3}{8}$	$4\frac{3}{4}$	$7\frac{11}{12}$	$6\frac{13}{16}$	$7\frac{3}{4}$	$8\frac{7}{10}$
	$\frac{7}{16}$	$\frac{1}{8}$	3	$4\frac{5}{12}$	$6\frac{5}{16}$	$5\frac{3}{4}$	$3\frac{3}{10}$
7.	$\frac{7}{12}$	$\frac{4}{5}$	$2\frac{3}{7}$	$3\frac{9}{10}$	$8\frac{6}{12}$	$9\frac{1}{2}$	$7\frac{9}{16}$
	$\frac{5}{12}$	$\frac{2}{5}$	$1\frac{1}{7}$	$2\frac{7}{10}$	$\frac{1}{12}$	3	$1\frac{3}{16}$
8.	$\frac{7}{10}$	$\frac{1}{2}$	$6\frac{7}{8}$	$8\frac{11}{12}$	$4\frac{3}{10}$	$9\frac{5}{8}$	$4\frac{5}{12}$
	$\frac{1}{10}$	$\frac{1}{2}$	$3\frac{3}{8}$	$2\frac{7}{12}$	$1\frac{1}{10}$	$2\frac{3}{8}$	$\frac{5}{12}$
9.	$\frac{4}{12}$	$\frac{5}{6}$	$8\frac{4}{5}$	$6\frac{9}{10}$	$5\frac{15}{16}$	$1\frac{7}{8}$	$6\frac{5}{16}$
	$\frac{3}{12}$	$\frac{1}{6}$	7	$\frac{3}{10}$	$3\frac{11}{16}$	$1\frac{1}{8}$	4
10.	$\frac{13}{16}$	$\frac{2}{3}$	$5\frac{5}{8}$	$9\frac{13}{16}$	$8\frac{7}{12}$	$4\frac{7}{8}$	$9\frac{11}{16}$
	$\frac{11}{16}$	$\frac{1}{3}$	$2\frac{1}{8}$	$4\frac{7}{16}$	$6\frac{1}{12}$	$2\frac{5}{8}$	$7\frac{3}{16}$
11.	$\frac{5}{12}$	$\frac{3}{4}$	$4\frac{3}{8}$	$8\frac{9}{10}$	$4\frac{9}{16}$	$6\frac{4}{5}$	$8\frac{11}{12}$
	$\frac{1}{12}$	$\frac{1}{4}$	$2\frac{3}{8}$	$3\frac{1}{10}$	$\frac{5}{16}$	$3\frac{1}{5}$	$4\frac{1}{12}$

1. The busses to Troy cover 164 mi. on each round trip. Last year one of the busses made 320 round trips. How many miles in all did that bus run last year?

To multiply 164 by 320, you can multiply it by 32 and annex a zero to the result. To do this, write 320 under 164, as shown in the example, letting the 0 stand out at the right. When you begin the work, first write the 0 of 320 below the line and then multiply by 2 and by 3. Be sure to write the 2 of 492 under the 3 by which you multiplied. How do you finish the work?

```
  164
  320
 3280
492
52480
```

2. Multiply 176 by 308.

You can do the work as shown in *A*. First multiply 176 by 8, which gives 1408. Next multiply 176 by 0 and write a row of zeros under 1408; then multiply by 3. It saves time, however, to do the work as shown in *B* where the row of zeros is omitted; be sure to write the 8 of 528 directly under the 3 of 308. Tell two different ways to check the work.

```
A          B
 176       176
 308       308
 1408      1408
 000       528
528        54208
54208
```

Multiply. To check the work interchange the numbers in each example and multiply again:

3.	709	643	582	642	126	291
	850	290	460	608	407	209
4.	479	196	658	385	419	684
	370	540	130	905	803	506
5.	709	583	473	239	375	287
	690	780	240	306	701	408
6.	549	173	748	365	253	629
	420	670	590	802	305	107

In several problems on this page some numbers are given that are not needed in finding the answer. Tell which numbers are not needed and then work the problem:

1. Jack bought 5 lb. of potatoes for 28¢, 2 lb. of peas for 25¢, and a head of lettuce for 15¢. How much did all these things cost?

In solving this problem you do not use 5 lb. or 2 lb. The only numbers used in getting the answer are 28¢, 25¢, and 15¢.

2. Tom bought a pair of shoes at a sale today for $2.95. Last week these shoes sold for $3.50. After buying the shoes how much money did Tom have left from $5.00?

3. Dick wants to buy a pair of skates for $3.50. He has worked 3 Saturdays and has earned $1.70 all together. How much more must he earn to buy the skates?

4. Mary bought $\frac{3}{4}$ lb. of candy at $.80 a pound and a pound of nuts for $.40. How much did she pay for both?

5. George has 20 hens. Yesterday he got 15 eggs and today he got 17 eggs. He sold a dozen eggs today. How many eggs does he have left?

6. Bill sells newspapers 6 days each week. He sold 40 papers on Monday, 32 on Tuesday, and 36 on Wednesday. How many papers, on the average, did he sell per day for the 3 days?

7. Henry bought $1\frac{1}{2}$ lb. of hard candy and 1 lb. of taffy for his party. How many pounds of candy did he buy?

8. A round-trip ticket from Johnstown to Riverdale costs $2.50. A one-way ticket costs $1.35. How much did Joe pay for 2 one-way tickets?

9. Today Bob went to the store twice. The first time he paid 65¢ for some bread and some eggs; the bread cost 15¢ and the eggs cost 50¢. The second time he paid 35¢ for tea. How much did he spend at the store today?

1. Joe is planning to go on an automobile trip of 210 mi. with his father. His father drives at an average speed of 35 mi. an hour. Joe wants to know how many hours it will take his father to drive 210 mi.

Joe starts to divide 210 by 35. He thinks like this: "21 ÷ 3 = 7. 7 × 35 = 245." But 245 is larger than 210 so he cannot subtract 245 from 210. This shows that 7 is too large as the quotient. See the work at the right.

```
      7
35)210
   245
```

Then Joe tries 6 as quotient. He multiplies 35 by 6 and gets 210. Subtracting 210 from 210, Joe gets a remainder of 0. Since 0 is *less* than the divisor 35, 6 is the right quotient. See the work at the right.

```
      6
35)210
   210
     0
```

Divide and check. If the quotient figure is too large, try the next smaller number:

2.	31)270	23)184	62)180	32)150	22)129
3.	25)150	22)148	34)162	41)200	55)375
4.	42)320	21)102	22)184	35)268	33)185
5.	61)421	43)205	32)121	44)329	25)175
6.	35)150	52)450	23)161	24)144	45)345
7.	21)183	64)508	53)259	31)214	23)120

When the quotient figure is too large, try the next smaller figure. When the quotient figure is right, the remainder is smaller than the divisor.

Single correction of quotient figures.

1. A truck driver drove 600 mi. at an average speed of 25 mi. an hour. How many hours did the trip take?

You must divide 600 by 25.

You get the first quotient figure as shown at *A*. Think "6 ÷ 2 = 3." You find that 3 is too large because 3×25=75 and 75 cannot be subtracted from 60. Then try 2 as the first quotient figure. 2 is right because you can subtract 50 from 60 and also because the remainder 10 is less than the divisor 25.

A	*B*
2	24
25)600	25)600
50	50
10	100
	100

You get the second quotient figure as shown at *B*. Bring down the next 0 from the dividend which gives a new partial dividend of 100. Think "10 ÷ 2 = 5." 5 is too large; tell why. Try 4. 4 is right; tell why. The answer is 24. The trip took 24 hr. Check by multiplying 24 by 25.

2. If the truck driver makes a trip of 900 mi. at 25 mi. an hour, how many hours will the trip take?

Divide. Check the work by multiplying:

3.	34)918	31)1829	42)2436	24)1296	21)1806
4.	23)621	35)2170	63)4284	43)3354	25)1075
5.	24)840	72)2808	23)1794	22)1848	32)2432
6.	34)959	55)4510	22)1452	65)4810	44)3212
7.	33)957	43)2881	41)2019	45)3510	23)1541
8.	24)600	75)5775	34)1292	62)5417	34)1632
9.	35)910	45)2025	41)3239	21)1617	35)1260

In each problem first tell what the hidden question is and answer it. See page 31. Then answer the question asked in the problem:

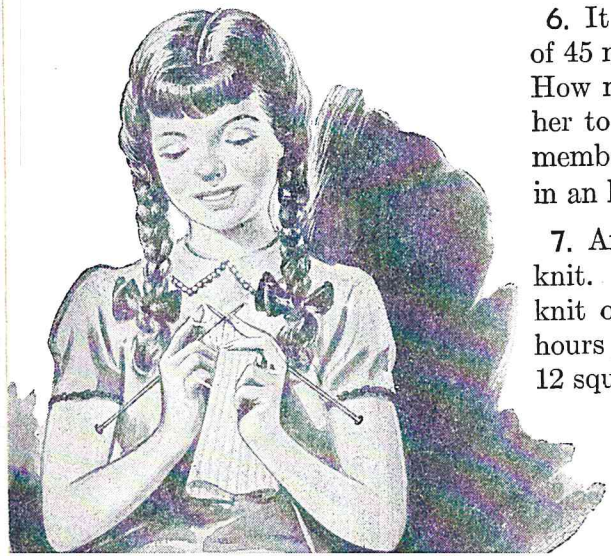
1. Our school made $45.72 by giving a play and $8.35 by having a hobby show. The money was divided equally among 8 school clubs. How much did each club get?

2. Our class of 35 pupils bought 4 packages of paper and divided it equally. There were 500 sheets in each package. How many sheets of paper did each pupil get? How many sheets were left over?

3. The Thread and Needle Club bought 24 dolls and dressed them to give to little girls in the hospital. The dolls cost $6.75 and materials to dress them cost $3.09. Find the average cost of a doll.

4. Mr. Smith bought 3 boxes of oranges with 176 oranges in each box. He sold the oranges in bags, putting 24 oranges in each bag. How many bags of 24 oranges did he have?

5. The 8 girls in the Knitting Club are knitting squares of many colors which they will sew together to make a blanket. They need 96 squares in all and each girl will make the same number. Mary has already knit 5 squares. How many more squares does she need to make?



6. It takes Mary an average of 45 min. to knit one square. How many hours will it take her to knit 12 squares? Remember there are 60 minutes in an hour.

7. Ann has just learned to knit. It takes her 70 min. to knit one square. How many hours will it take Ann to knit 12 squares?

1. It is easy to find the quotient figures in the exercises at the right. Study them carefully.

In *A*, you can easily see that 28 contains 24 just once; so the quotient figure is 1. In *B*, you see that the quotient figure is 1 also.

A.
```
   1
24)28
   24
    4
```

B.
```
   1
62)69
   62
    7
```

In the examples above, the dividend is only slightly larger than the divisor. In these cases you see by *inspection* that the quotient is 1.

2. The following exercises show how easy it is to tell when the quotient figure is 0.

C.
```
   10
35)382
   35
   32
    0
   32
```

D.
```
   20
43)896
   86
   36
    0
   36
```

E.
```
   30
55)1652
   165
     2
     0
     2
```

F.
```
   40
62)2530
   248
    50
     0
    50
```

In *C* the first quotient figure is 1. The second quotient figure is 0 because the partial dividend 32 does not contain 35. Write 0 in the quotient. Then multiply 35 by 0, which gives 0. Write 0 under 32 and subtract. The remainder is 32. In *D*, *E*, and *F* tell in each case why the second quotient figure is 0.

Find the quotients by inspection, when possible; otherwise divide by the first figure of the divisor:

3. 24)29 23)279 64)1955 35)1787 54)3783

4. 44)48 41)866 92)4693 95)1160 83)1770

5. 35)37 34)715 73)2194 24)1208 92)4698

6. 52)59 61)674 44)1792 55)2258 63)2528

1. The 32 English books for our class cost $29.12. What was the cost of each book?

2. The pupils in our class paid $5.12 for 32 yd. of cloth to make costumes for the play. How much did the cloth cost per yard?

3. If a train travels at the rate of 45 mi. an hour, how many hours will it take to travel a distance of 1395 mi.?

4. Helen's mother bought some furniture. She paid part of the bill when she got the furniture. She still owes $264 on it. If she pays the store $22 a month, how many months will it take her to pay $264?

5. Mary is going to visit her grandmother who lives in Denver. The train Mary will take makes the trip in 20 hr. The timetable shows the distance is 820 mi. How many miles per hour does the train average?

Divide and check. If there is a remainder, write R before it:

6.	21)735	32)806	44)1027	32)1928	31)2418
7.	65)689	42)889	31)1333	51)3849	63)2658
8.	32)992	53)596	42)1302	34)1836	55)1145
9.	43)956	22)597	25)1509	71)2066	44)1188
10.	24)792	34)704	61)2629	45)1485	23)1426
11.	21)798	31)899	44)3784	82)2227	74)4810
12.	54)658	51)974	35)1476	24)1512	92)3588
13.	31)809	23)713	72)2959	62)1061	45)3633

If you are skillful in computing, you should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1.	52	70	43	38	61	50	23	84
	68	89	86	87	27	15	74	46
	75	47	29	74	68	96	35	59
	89	96	50	65	79	39	26	33
	34	37	15	29	54	84	67	47
	33	55	64	53	22	48	69	34

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2.	6908	7502	4971	6234	9076
	5896	3771	4253	2259	3188
3.	5453	9054	5000	9518	6210
	2659	7645	1343	4874	3348

Multiplication Test

Copy and multiply: Time: 4 min. after copying.*

4.	2493	3459	2035	1479	1607
	47	52	63	18	95

Division Test

Copy and divide: Time: 4 min. after copying.*

5.	8)2356	6)4931	9)3738	7)2597
6.	9)5674	7)6384	6)5448	8)7073

* In these tests copy all the exercises on a sheet of paper, spreading them over the sheet to allow working space. See page 308.

1. Last October the gardeners in the park planted 1800 bulbs in 24 long rows, putting the same number in each row. How many bulbs did they plant in each row?

You divide 1800 by 24 like this:

```
      75
24)1800
   168
    120
    120
```

Think "18 ÷ 2 = 9." You see that 9 is too large for the first quotient figure because 9 × 24 = 216 and 216 cannot be subtracted from 180. Next try 8. 8 is also too large because 8 × 24 = 192 and 192 cannot be subtracted from 180. Then try 7. 7 is right because 168 is less than 180 and the remainder 12 is *less* than the divisor 24. Tell how the second quotient figure is found. The quotient is 75. There were 75 bulbs planted in each row.

2. John can save 25¢ a week. How many weeks will it take him to save $14.00 for a radio?

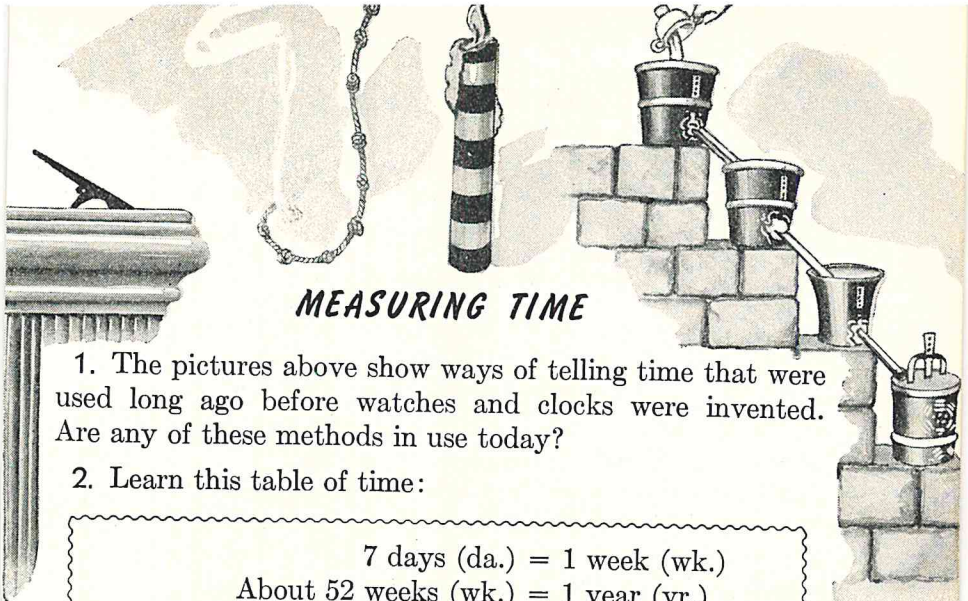
Change $14.00 to 1400¢ and divide by 25¢.

3. Henry thinks he will save his money until he can pay $27.30 for a radio. If he saves 35¢ a week, for how many weeks will he need to save to get that amount? How many weeks longer does Henry need to save than John?

Divide and check by multiplying:

4. 180 ÷ 23	1947 ÷ 25	1632 ÷ 24	1850 ÷ 25
5. 270 ÷ 34	1801 ÷ 23	1800 ÷ 25	1875 ÷ 25
6. 185 ÷ 24	1824 ÷ 24	2730 ÷ 35	1872 ÷ 24
7. 276 ÷ 35	1400 ÷ 25	1848 ÷ 24	1442 ÷ 25
8. 190 ÷ 25	1608 ÷ 24	1671 ÷ 25	2711 ÷ 35
9. 240 ÷ 35	1900 ÷ 25	1809 ÷ 23	1661 ÷ 25

To THE TEACHER: By using the methods of long division given in this book, the number of cases where it is necessary to correct the quotient figure twice, as shown above, is extremely small, being only $\frac{1}{2}$ of 1% of all possible cases. In all other cases where the quotient figure needs correction, a single correction is sufficient.



MEASURING TIME

1. The pictures above show ways of telling time that were used long ago before watches and clocks were invented. Are any of these methods in use today?

2. Learn this table of time:

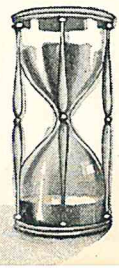
7 days (da.)	=	1 week (wk.)
About 52 weeks (wk.)	=	1 year (yr.)
365 days or 12 months (mo.)	=	1 year (yr.)
366 days (da.)	=	1 leap year
100 years (yr.)	=	1 century

3. Leap years come every 4 years. To tell whether a year is a leap year, divide the year by 4. If there is no remainder, the year is a leap year. The years 1940 and 1944 were leap years. Century years, such as 1900 and 2000, are leap years only when they can be divided by 400 without a remainder. Which of these years are leap years: 1877, 1880, 1900, 1903, 1924, 1930, 1936, 2000?

4. The words *decade* and *score* are sometimes used in counting time. A *decade* is 10 years; a *score* is 20 years. One day Mary's grandfather told her: "I am 3 score and 10 years old; for 5 decades I have been a farmer." How old is he? For how many years has he been a farmer? How many years are 4 score and 3 years? 3 decades?

Tell what numbers should be put in the spaces:

5. 6 mo. = . . . yr. 70 yr. = . . . decades
6. 40 da. = . . . wk. 600 yr. = . . . centuries



1. Name the numerator and denominator of each fraction:

$\frac{5}{6}$ $\frac{1}{4}$ $\frac{8}{8}$ $\frac{3}{8}$ $\frac{7}{4}$ $\frac{12}{4}$ $\frac{15}{16}$ $\frac{10}{10}$

2. Tell which fractions in ex. 1 are proper fractions.

3. Tell which fractions in ex. 1 are improper fractions.

4. Reduce each of these fractions to lowest terms:

$\frac{6}{8}$ $\frac{10}{12}$ $\frac{4}{6}$ $\frac{8}{10}$ $\frac{9}{12}$ $\frac{10}{16}$ $\frac{14}{16}$ $\frac{14}{20}$

5. Change these fractions to whole numbers or mixed numbers. Reduce fractions in answers to lowest terms:

$\frac{10}{8}$ $\frac{12}{3}$ $\frac{12}{10}$ $\frac{20}{4}$ $\frac{26}{6}$ $\frac{30}{10}$ $\frac{19}{12}$ $\frac{18}{16}$

Add. Check the work by going over it:

6. $\frac{2}{8}$ $\frac{3}{5}$ $\frac{3}{8}$ $3\frac{1}{3}$ $2\frac{4}{6}$ $3\frac{1}{8}$ $4\frac{1}{12}$
$\underline{\frac{1}{8}}$ $\underline{\frac{1}{5}}$ $\underline{\frac{2}{8}}$ $\underline{2\frac{1}{3}}$ $\underline{1\frac{1}{6}}$ $\underline{2\frac{6}{8}}$ $\underline{2\frac{4}{12}}$

7. $\frac{1}{8}$ $\frac{1}{2}$ $\frac{5}{6}$ $1\frac{2}{8}$ $5\frac{1}{4}$ $2\frac{7}{12}$ $3\frac{2}{3}$
$\underline{\frac{1}{8}}$ $\underline{\frac{1}{2}}$ $\underline{\frac{2}{6}}$ $\underline{2\frac{6}{8}}$ $\underline{3\frac{1}{4}}$ $\underline{\frac{1}{12}}$ $\underline{2\frac{1}{3}}$

8. $\frac{6}{10}$ $\frac{5}{12}$ $\frac{7}{10}$ $4\frac{3}{16}$ $2\frac{2}{5}$ $3\frac{7}{8}$ $1\frac{9}{10}$
$\underline{\frac{3}{10}}$ $\underline{\frac{11}{12}}$ $\underline{\frac{5}{10}}$ $\underline{\frac{5}{16}}$ $\underline{1\frac{4}{5}}$ $\underline{\frac{7}{8}}$ $\underline{\frac{4}{10}}$

Subtract. Check the work by going over it:

9. $\frac{3}{10}$ $\frac{4}{7}$ $\frac{7}{10}$ $\frac{7}{12}$ $3\frac{13}{16}$ $2\frac{11}{12}$ $1\frac{7}{10}$
$\underline{\frac{2}{10}}$ $\underline{\frac{2}{7}}$ $\underline{\frac{5}{10}}$ $\underline{\frac{4}{12}}$ $\underline{1\frac{9}{16}}$ $\underline{\frac{4}{12}}$ $\underline{1\frac{3}{10}}$

10. $\frac{5}{5}$ $\frac{2}{3}$ $\frac{3}{4}$ $\frac{11}{12}$ $2\frac{7}{12}$ $5\frac{3}{10}$ $3\frac{7}{16}$
$\underline{\frac{2}{5}}$ $\underline{\frac{2}{3}}$ $\underline{\frac{1}{4}}$ $\underline{\frac{3}{12}}$ $\underline{2\frac{5}{12}}$ $\underline{2\frac{1}{10}}$ $\underline{\frac{5}{16}}$

11. Jack cut a piece $1\frac{1}{4}$ ft. long from a board that was $3\frac{3}{4}$ ft. long. How long was the other piece?

12. It is $4\frac{1}{4}$ mi. from Flint to Troy and $5\frac{1}{4}$ mi. farther to Jackson. How far is it from Flint to Jackson?

1. The multiplication facts for the 11's are very easy. You probably know them. If not, learn these facts:

11	11	11	11	11	11	11	11	11
1	2	3	4	5	6	7	8	9
11	22	33	44	55	66	77	88	99

2. Helen is planning to buy 4 boxes of cookies for the party. At 11¢ a box, how much will she spend for cookies?

3. Jane's mother bought 2 lb. of beans at 11¢ a pound. How much did she pay for the beans?

4. The sewing class needs 11 yd. of ribbon. How much will the ribbon cost at 8¢ a yard?

5. There are 11 boys on a football team. How many boys will we need for 4 teams?

6. In everyday life you often use the number 12 in connection with measures. There are 12 inches in 1 foot, 12 months in 1 year, 12 things in 1 dozen, and 12 hours on the face of the clock. If you need to know how many inches there are in 4 feet, or how many things there are in 6 dozen, it saves time to know the 12's facts in multiplication.

7. Learn these multiplication facts for the 12's:

12	12	12	12	12	12	12	12	12
1	2	3	4	5	6	7	8	9
12	24	36	48	60	72	84	96	108

8. Ann is 4 ft. tall. How many inches tall is she? Ann's brother is 6 ft. 3 in. tall. How many inches tall is he?

9. Alice measured the windows in her room. They are 5 ft. 4 in. high. How many inches high are the windows?

10. Jack sells 8 doz. eggs every week to his customers. How many eggs is that?

11. How much will you save in 1 yr. if you save $3 each month? if you save $7 each month?

12. Count by 12's to 120, thus: 12, 24, 36, etc.

1. Bob keeps hens. Last month he got 384 eggs. How many dozen eggs did he get last month?

To find how many dozen there are you must divide 384 by 12. Think "How many 12's are there in 38?" Since you know the 12's facts in multiplication you see that there are three 12's in 38. Write 3 in the quotient over 8. Then think "3 × 12 = 36." Write 36 under 38 and subtract. The remainder is 2. Since 2 is less than the divisor 12, 3 is the correct quotient figure. Tell how to get the next quotient figure. How many dozen eggs did Bob get?

$$\begin{array}{r} 32 \\ 12\overline{)384} \\ \underline{36} \\ 24 \\ \underline{24} \end{array}$$

2. A fast train made a trip of 484 mi. in 11 hr. How many miles per hour did the train average?

Divide. Use the 11's and 12's facts you have just learned:

3.	$11\overline{)352}$	$11\overline{)268}$	$12\overline{)348}$	$12\overline{)607}$	$11\overline{)456}$
4.	$11\overline{)242}$	$11\overline{)583}$	$12\overline{)684}$	$12\overline{)996}$	$11\overline{)950}$
5.	$12\overline{)372}$	$11\overline{)497}$	$12\overline{)535}$	$11\overline{)379}$	$12\overline{)336}$
6.	$12\overline{)540}$	$12\overline{)157}$	$11\overline{)479}$	$12\overline{)757}$	$11\overline{)889}$
7.	$11\overline{)189}$	$11\overline{)253}$	$12\overline{)859}$	$11\overline{)576}$	$12\overline{)637}$
8.	$11\overline{)399}$	$12\overline{)773}$	$11\overline{)842}$	$12\overline{)905}$	$11\overline{)200}$
9.	$12\overline{)425}$	$11\overline{)400}$	$12\overline{)721}$	$11\overline{)620}$	$12\overline{)809}$
10.	$11\overline{)715}$	$12\overline{)408}$	$11\overline{)924}$	$12\overline{)497}$	$11\overline{)555}$
11.	$12\overline{)569}$	$11\overline{)803}$	$12\overline{)965}$	$11\overline{)815}$	$12\overline{)653}$

In each square add each row, each column, and each diagonal as you did on page 16. Is each square a magic square?

1

126	119	154
161	133	105
112	147	140

2

253	323	225
239	267	295
309	211	281

3

410	305	452
431	389	347
326	473	368

Find the missing numbers in each square below so that it will be a magic square. First find what each sum should be. Be sure to test your final square:

4

530	441	
975	619	
352		

5

366		278
311	300	355

6

411	390	
	402	408
	414	

7

883	225	
	601	
	977	

8

858		502
	591	
		324

9

714		
	625	
	447	536

10. Make a new square in which the numbers are each 49 less than the numbers in the square in ex. 1. Is this new square a magic square?

11. Make a new square in which the numbers are each 125 more than the numbers in the square in ex. 2.

1. Jim has saved \$7.25 to spend for Christmas. He wants to spend \$3.50 for his mother and father and buy presents for his 3 brothers with the rest. If he spends the same amount for each brother, how much can each present cost?

2. Alice tries to practice her music lesson $4\frac{3}{4}$ hr. each week. She practiced $\frac{3}{4}$ hr. Monday, $\frac{3}{4}$ hr. Tuesday, and $\frac{3}{4}$ hr. Wednesday. How many hours does she need to practice the rest of the week?

3. The school store bought a box of 144 pencils for \$5.95. They sold the pencils at 5¢ each. How much did they make on the pencils?

4. Our lunchroom served these numbers of children on the five school days last week: 186, 175, 193, 202, 194. Find the average number of children served per day.

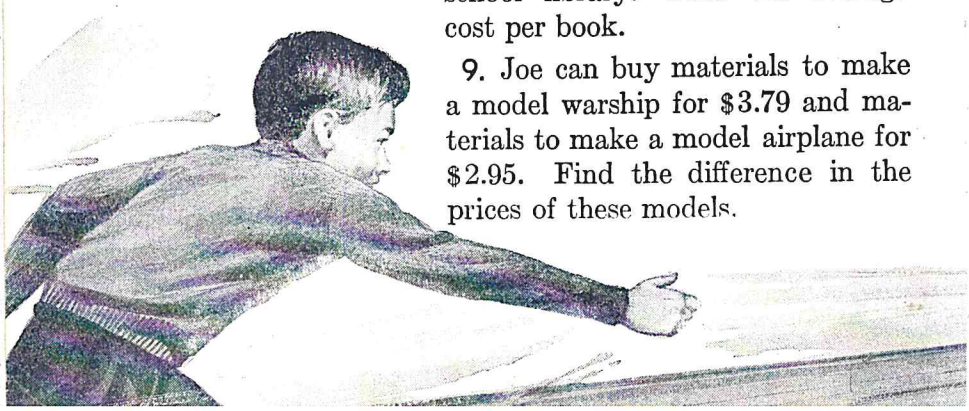
5. Jack was born in 1935 and his brother was born in 1929. How much younger is Jack than his brother?

6. Last week 34 children went to the art museum with Miss White and Miss Lee. The children each brought a quarter to Miss White and she bought all the tickets at one time. How much money did the children bring? How much money did Miss White pay for 36 tickets to the museum?

7. Our school has just bought some arithmetic workbooks for \$17.28. The workbooks cost 24¢ each. How many workbooks did the school buy? First change \$17.28 to cents.

8. Our school also paid \$29.21 for 23 new books for the school library. Find the average cost per book.

9. Joe can buy materials to make a model warship for \$3.79 and materials to make a model airplane for \$2.95. Find the difference in the prices of these models.



1. At the school lunchroom 1890 glasses of milk were sold in 35 days. What was the average number of glasses of milk sold per day?

2. Some girls are going to make 12 costumes for a play. Each costume will take 3 yd. of material. At 15¢ a yard, find the cost of the material for 12 costumes.

3. Jack's mother bought 6 sheets at $1.25 each. How much change did she have left from $10.00?

4. Mary paid $6.89 for a pair of shoes yesterday. That was $1.25 more than she paid for the shoes she bought last spring. How much did Mary pay for shoes last spring?

5. Our class spent $8.32 for food for the party. If we share the expense equally, how much should each of the 32 members of the class pay?

6. The temperature at noon on Monday was 26°; on Tuesday, 28°; on Wednesday, 20°; on Thursday, 18°. What was the average noon temperature for the 4 days?

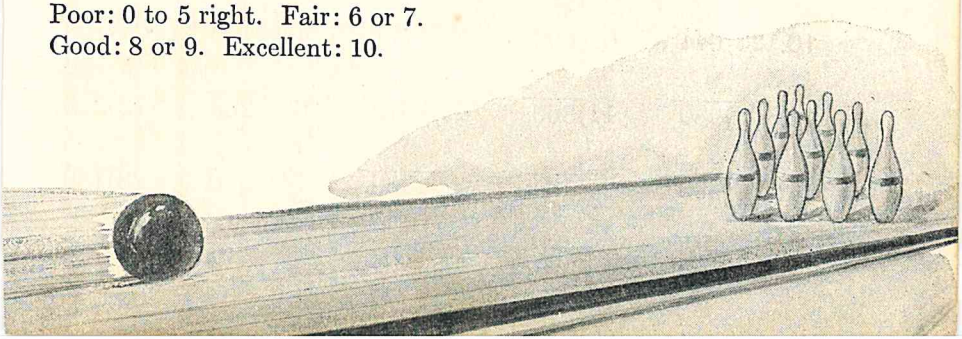
7. Jane paid $.80 in all for 2 jars of jam and a coffee cake. The 2 jars of jam cost $.50. How much did the coffee cake cost?

8. Bob's father averages about 33 mi. an hour in his car. At that rate, how many miles can he travel in 5 hr.?

9. Dick was measured in school today. He is 4 ft. 8 in. tall. How many inches tall is he?

10. How much money did Henry have left from $1.00 after he bought $\frac{1}{2}$ lb. of candy at $.70 a pound?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Mrs. Wood bought three pieces of cloth at a sale. She got pieces of these lengths: $2\frac{7}{8}$ yd., $3\frac{5}{8}$ yd., and $1\frac{5}{8}$ yd. How many yards of cloth did she get in all?

2. Mrs. Wood made Betty a dress from the piece that was $2\frac{7}{8}$ yd. long. She used $2\frac{3}{8}$ yd. of it. How long was the piece she had left?

3. Mrs. Wood made herself a dress from the piece that was $3\frac{5}{8}$ yd. long. She had a piece 9 in. long left over. What part of a yard did she have left?

4. How many dozen eggs are 336 eggs? 174 eggs?

5. How many years are 156 months? 180 months?

6. What part of a gallon is 3 qt.? 2 qt.? 1 qt.?

7. Show by an example that you know the meaning of each of these words: numerator, denominator, proper fraction, improper fraction, mixed number, multiplier, quotient.

Add. Reduce fractions in answers to lowest terms:

8.	$\frac{1}{2}$	$1\frac{3}{4}$	$\frac{5}{16}$	$2\frac{1}{6}$	$3\frac{5}{12}$	7	$2\frac{1}{8}$
	$\frac{1}{2}$	$2\frac{3}{4}$	$\frac{10}{16}$	$1\frac{5}{6}$	4	$4\frac{3}{5}$	$2\frac{3}{8}$
	$2\frac{1}{2}$	6	$\frac{7}{16}$	$2\frac{3}{6}$	$1\frac{5}{12}$	2	$5\frac{3}{8}$

Subtract. Reduce fractions in answers to lowest terms:

9.	$6\frac{2}{3}$	$5\frac{5}{8}$	$\frac{15}{16}$	$8\frac{5}{6}$	$9\frac{11}{12}$	$5\frac{3}{4}$	$7\frac{3}{4}$
	4	$2\frac{3}{8}$	$\frac{7}{16}$	$2\frac{1}{6}$	$4\frac{5}{12}$	$4\frac{1}{4}$	$4\frac{3}{4}$

Divide and check the work:

10.	$23\overline{)644}$	$62\overline{)693}$	$23\overline{)1771}$	$43\overline{)2160}$	$24\overline{)1032}$
11.	$35\overline{)980}$	$11\overline{)860}$	$42\overline{)3612}$	$63\overline{)3203}$	$72\overline{)2237}$
12.	$53\overline{)593}$	$25\overline{)194}$	$12\overline{)1068}$	$74\overline{)4910}$	$23\overline{)1807}$

DO YOU NEED HELP?

If you miss more than one example in any row, turn to the Practice Page for that row.

						PRACTICE PAGES
Reduce these fractions to lowest terms:						
1.	$\frac{4}{10}$	$\frac{8}{16}$	$\frac{3}{9}$	$\frac{12}{16}$	$\frac{10}{12}$	81
Reduce to whole numbers or mixed numbers:						
2.	$\frac{12}{4}$	$\frac{13}{10}$	$\frac{12}{8}$	$\frac{20}{16}$	$\frac{50}{5}$	91
Add. Check the work by going over it:						
3.	$\frac{1}{6}$	$\frac{4}{8}$	$4\frac{1}{3}$	$1\frac{2}{12}$	$2\frac{1}{16}$	79
	$\frac{4}{6}$	$\frac{1}{8}$	$2\frac{1}{3}$	$\frac{3}{12}$	$1\frac{4}{16}$	
4.	$2\frac{3}{8}$	$5\frac{1}{6}$	$4\frac{1}{4}$	$3\frac{1}{10}$	$2\frac{1}{12}$	83
	$2\frac{1}{8}$	$3\frac{3}{6}$	$\frac{1}{4}$	$1\frac{4}{10}$	$\frac{8}{12}$	
5.	$\frac{1}{6}$	$\frac{5}{8}$	$2\frac{2}{5}$	$4\frac{7}{10}$	$2\frac{5}{12}$	93
	$\frac{5}{6}$	$\frac{4}{8}$	$3\frac{3}{5}$	$2\frac{4}{10}$	$3\frac{7}{12}$	
6.	$2\frac{3}{4}$	$4\frac{3}{8}$	$2\frac{7}{10}$	$2\frac{7}{16}$	$1\frac{9}{12}$	94
	$1\frac{3}{4}$	$2\frac{7}{8}$	$3\frac{5}{10}$	$3\frac{11}{16}$	$\frac{7}{12}$	
Subtract. Check the work by going over it:						
7.	$\frac{7}{8}$	$\frac{9}{10}$	$2\frac{3}{5}$	$4\frac{5}{6}$	$3\frac{9}{16}$	85
	$\frac{2}{8}$	$\frac{5}{10}$	$1\frac{1}{5}$	$2\frac{3}{6}$	$\frac{5}{16}$	
Divide and check. Write R before each remainder:						
8.	$32\overline{)120}$	$21\overline{)670}$	$34\overline{)1224}$	$54\overline{)3523}$		99
9.	$74\overline{)79}$	$43\overline{)456}$	$22\overline{)1328}$	$61\overline{)1891}$		101

Diagnostic test.

CHAPTER FOUR

Adding and Subtracting Unlike Fractions

WALTER'S CHICKENS

1. Walter has 32 Rhode Island Red hens. Last year, during the month of January, he got 576 eggs. Find the average number of eggs per hen that he got that month.

2. How many dozen eggs did Walter get in January? See ex. 1. Walter sold all the eggs at 52¢ a dozen. What did he get for the month's eggs?

3. In January he fed his hens 235 lb. of mash that cost $8.24, 80 lb. of mixed grain that cost $2.48, and other feed that cost $.24. How much in all did he pay for feed in January?

4. During February he got 516 eggs. He sold 24 doz. of them at $.48 a dozen and the rest of them at $.45 a dozen. How much did Walter get for his eggs in February?

5. In February he paid $7.98 for mash, $2.20 for mixed grain, and $.35 for other feed. How much did Walter pay for feed in February? How much more did he get for his eggs in February than he paid for feed? See ex. 4.

6. During March Walter sold 480 eggs to the store at $.44 a dozen and 144 eggs to the neighbors at $.52 a dozen. He paid $10.80 that month for feed. How much more money did he receive in March than he paid out?

7. During the full year Walter got $278.40 for his eggs. His feed and other costs for the year were $137.60. What was Walter's profit for the year?

1. If the gasoline tanks in an airplane hold 850 gal. and the gasoline weighs 6 lb. a gallon, how many pounds of gasoline will an airplane carry when the tanks are full?

2. Bill and his father flew to Chicago in an airplane. The distance by plane was 609 mi. and the flying time was 3 hr. How many miles per hour did they average?

3. Mr. Jones ordered 65 copies of a new book to sell in his bookstore. Each copy cost him $1.26. How much in all did the books cost?

4. Mrs. Brown bought $4\frac{1}{4}$ yd. of blue cloth for a dress for herself and $2\frac{3}{4}$ yd. of red cloth for Mary's dress. How many yards of cloth did she buy in all?

5. Joe Allen lives $1\frac{3}{4}$ mi. from school. Tom Johnson lives $1\frac{1}{4}$ mi. from school. How much farther from school does Joe live than Tom?

6. A 10-trip bus ticket to the city from Ed's home costs $3.80. A single-trip ticket costs $.43. How much cheaper is a ride on a 10-trip ticket than on a single-trip ticket?

7. When Mr. Green left home for Chicago the speedometer on his car read 9468 mi. When he arrived at Chicago the speedometer read 9728 mi. The driving time was 8 hr. How many miles per hour did the car average?

8. Mrs. Smith bought 3 chairs at $5.95 each. How much change did she get from $20.00?

9. Our school bought 265 arithmetic books at $.96 each. What was the total cost of these books?

10. Jack sells papers. In 23 days last month he sold a total of 1035 papers. What was the average number of papers Jack sold per day?

11. Yesterday George bought an overcoat for $24.15 and a suit for $20.65. How much more did he pay for the overcoat than for the suit?

Multiply and check the work:

1. 58	649	607	$32.95	$40.80
60	273	258	19	42
2. 59	486	392	$27.08	$26.19
20	395	684	57	26

Divide and check. Write the remainder as a fraction in the quotient:

3. $20\overline{)79}$	$33\overline{)231}$	$31\overline{)219}$	$22\overline{)1144}$	$42\overline{)1517}$
4. $30\overline{)53}$	$52\overline{)315}$	$61\overline{)644}$	$24\overline{)1056}$	$33\overline{)1320}$
5. $21\overline{)89}$	$11\overline{)463}$	$54\overline{)594}$	$62\overline{)1627}$	$55\overline{)3135}$

6. Write an improper fraction. Write a proper fraction.

7. Reduce each fraction to lowest terms:

$\frac{6}{9}$ $\frac{10}{12}$ $\frac{4}{6}$ $\frac{9}{12}$ $\frac{6}{16}$ $\frac{12}{16}$ $\frac{12}{18}$ $\frac{15}{20}$

8. Reduce to a whole number or a mixed number:

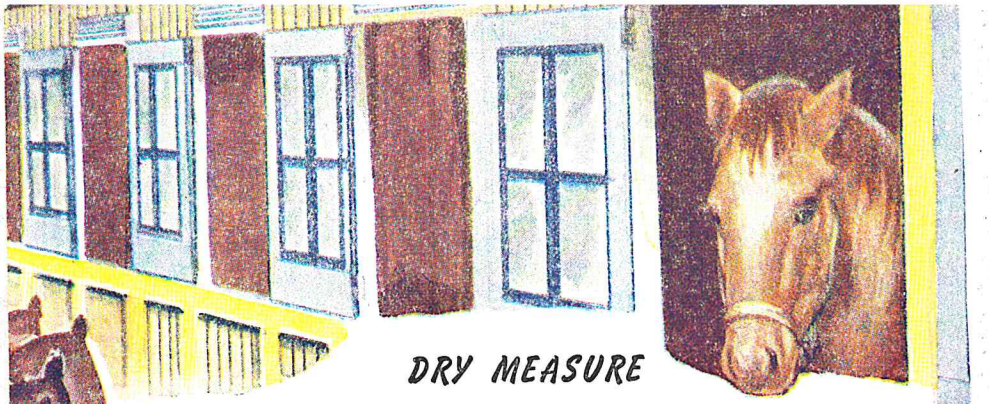
$\frac{36}{6}$ $\frac{26}{8}$ $\frac{17}{10}$ $\frac{15}{12}$ $\frac{17}{16}$ $\frac{25}{5}$ $\frac{18}{8}$ $\frac{14}{3}$

Add and check:

9. $2\frac{1}{2}$	$4\frac{1}{3}$	$3\frac{1}{10}$	$2\frac{3}{12}$	$1\frac{5}{6}$	$2\frac{9}{16}$
$1\frac{1}{2}$	$\frac{1}{3}$	$2\frac{3}{10}$	$\frac{5}{12}$	$1\frac{2}{6}$	$\frac{9}{16}$
10. $\frac{2}{6}$	$2\frac{5}{7}$	$1\frac{7}{16}$	$3\frac{6}{12}$	$2\frac{6}{8}$	$1\frac{3}{4}$
$\frac{4}{6}$	$1\frac{3}{7}$	$\frac{13}{16}$	$\frac{1}{12}$	$\frac{5}{8}$	$3\frac{3}{4}$

Subtract and check:

11. $2\frac{7}{10}$	$3\frac{2}{6}$	$\frac{9}{16}$	$2\frac{3}{10}$	$4\frac{7}{8}$	$1\frac{11}{16}$
$\frac{5}{10}$	$1\frac{1}{6}$	$\frac{5}{16}$	$\frac{3}{10}$	$\frac{1}{8}$	$\frac{3}{16}$



DRY MEASURE

1. Jim feeds his horse 4 qt. of oats a day. He measures the oats with a quart measure. The quart is one of the units of dry measure. The dry quart is a little larger than the liquid quart.

2. This is the table of dry measure. Learn it:

2 pints (pt.)	=	1 quart (qt.)
8 quarts (qt.)	=	1 peck (pk.)
4 pecks (pk.)	=	1 bushel (bu.)

3. How many quarts are there in a bushel? How many days will a bushel of feed last if a horse eats 4 qt. a day?

4. In a recent year the farmers of this country raised 357,783,000 bu. of potatoes and 945,937,000 bu. of wheat. Read each of these numbers.

5. The farmers of Maine raised more potatoes than those of any other state. In a recent year the potato crop in Maine was 41,026,000 bu., while the crop in Michigan was 21,676,000 bu. Was the Maine crop about 2 or 3 times as large as the Michigan crop?

6. Name three things besides oats, potatoes, and wheat that are sold by dry measure.

7. Some things that were formerly sold by dry measure are now sold by the pound. You may live where potatoes are sold by the bushel and peck, but in another place they

may be sold by the pound. What advantage do you see in selling potatoes by the pound instead of by dry measure?

8. A bushel of potatoes weighs 60 lb. How many pounds does a peck of potatoes weigh? Potatoes are often sold in 5-pound bags. How many 5-pound bags will a grocer get from 1 bushel of potatoes?

9. Find out how these things are sold where you live: strawberries, apples, potatoes, string beans, cherries, wheat, tomatoes, peaches.

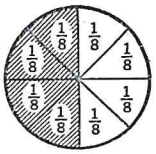
10. In some places fruits like bananas and oranges that used to be sold by the dozen are now sold by the pound. Why is this done? What is the cost of 4 lb. of bananas at 12¢ a pound? of 2 lb. of string beans at 18¢ a pound?

Tell what number should be put in each space:

11. 8 pk. = . . . bu. 4 qt. = . . . bu. $\frac{1}{2}$ pk. = . . . qt.

12. 5 bu. = . . . pk. 4 qt. = . . . pk. $\frac{1}{2}$ bu. = . . . pk.

13. 2 pk. = . . . bu. 2 bu. = . . . qt. $\frac{1}{4}$ pk. = . . . qt.



1. The circle at the right is divided into eighths and shows that $\frac{4}{8} = \frac{1}{2}$ and that $\frac{1}{2} = \frac{4}{8}$. Since $\frac{4}{8}$ and $\frac{1}{2}$ are equal fractions, we say that $\frac{4}{8}$ and $\frac{1}{2}$ have the *same value.*

2. You have already learned that you can change $\frac{4}{8}$ to $\frac{1}{2}$ by *dividing* both terms of $\frac{4}{8}$ by 4 as shown below at *A*.

A. $\dfrac{4 \div 4}{8 \div 4} = \dfrac{1}{2}$ *B.* $\dfrac{1 \times 4}{2 \times 4} = \dfrac{4}{8}$ *C.* $\dfrac{3 \times 2}{4 \times 2} = \dfrac{6}{8}$

You can change $\frac{1}{2}$ back to $\frac{4}{8}$ by *multiplying* both terms of $\frac{1}{2}$ by 4, as shown at *B*.

3. In the same way you can change $\frac{3}{4}$ to $\frac{6}{8}$ by multiplying both terms of $\frac{3}{4}$ by 2 as shown above at *C*. By what number do you multiply both terms of $\frac{1}{2}$ to get $\frac{8}{16}$?

4. Suppose you wish to change $\frac{1}{4}$ to an equal fraction whose denominator is 12. You must tell what number to put in place of the star in $\frac{1}{4} = \frac{*}{12}$. You multiply the denominator of $\frac{1}{4}$ by 3 to get 12, so you must also multiply the numerator of $\frac{1}{4}$ by 3. This gives $\frac{1}{4} = \frac{3}{12}$. So 3 is put in place of the star.

In each exercise tell what number should be put in place of the star:

5.	$\frac{1}{3} = \frac{*}{6}$	$\frac{3}{3} = \frac{*}{6}$	$\frac{1}{2} = \frac{*}{12}$	$\frac{1}{4} = \frac{*}{16}$	$\frac{2}{8} = \frac{*}{16}$
6.	$\frac{2}{4} = \frac{*}{8}$	$\frac{2}{2} = \frac{*}{4}$	$\frac{3}{4} = \frac{*}{12}$	$\frac{1}{2} = \frac{*}{16}$	$\frac{1}{5} = \frac{*}{10}$
7.	$\frac{1}{2} = \frac{*}{8}$	$\frac{1}{4} = \frac{*}{8}$	$\frac{4}{8} = \frac{*}{16}$	$\frac{2}{6} = \frac{*}{12}$	$\frac{3}{8} = \frac{*}{16}$
8.	$\frac{4}{4} = \frac{*}{8}$	$\frac{1}{2} = \frac{*}{4}$	$\frac{1}{6} = \frac{*}{12}$	$\frac{1}{4} = \frac{*}{12}$	$\frac{4}{5} = \frac{*}{10}$
9.	$\frac{1}{2} = \frac{*}{6}$	$\frac{2}{3} = \frac{*}{6}$	$\frac{1}{2} = \frac{*}{10}$	$\frac{3}{5} = \frac{*}{10}$	$\frac{6}{6} = \frac{*}{12}$

If you multiply both terms of a fraction by the same number, you get another fraction with the same value.

1. You have learned that you can add only like things; like things have the *same name.* You can add 4 books and 3 books because they both have the same name. The answer is 7 books. You can add 6 dimes and 3 dimes because they both have the same name. The answer is 9 dimes.

2. You cannot add 4 dimes and 3 nickels because they have *different* names. You must first change them to equal things with the same name. You can change the 4 dimes to 8 nickels because they are equal. Then you can add 8 nickels and 3 nickels as shown at *A*.

A.
4 dimes = 8 nickels
3 nickels = 3 nickels
11 nickels

B.
3 quarts = 6 pints
3 pints = 3 pints
9 pints

3. You cannot add 3 quarts and 3 pints because they have different names. But you change 3 quarts to 6 pints since they are equal. Then you can add 6 pints and 3 pints, as shown at *B*.

4. Suppose you want to add 3 dogs and 2 cats. You cannot call the dogs cats and you cannot call the cats dogs. You can call both of them *animals*. Then 3 animals and 2 animals are 5 animals.

3 dogs = 3 animals
2 cats = 2 animals
5 animals

Add these. If the numbers do not have the same name, change them so that you can add them:

5.	4 cents 3 nickels	3 pints 4 pints	4 boys 5 girls	4 cents 2 dimes
6.	3 dimes 2 quarters	2 feet 3 yards	6 horses 2 cows	1 foot 7 inches
7.	2 minutes 3 seconds	1 hour 8 minutes	4 nickels 2 quarters	2 robins 4 sparrows

SHOVELING SNOW

1. Joe shovels snow for the neighbors. Today it took him $\frac{1}{2}$ hr. to shovel Mrs. Green's walk and $\frac{3}{4}$ hr. to shovel Mrs. Brown's walk. How many hours did Joe work today?

You have to add $\frac{1}{2}$ and $\frac{3}{4}$. You cannot add *halves* and *fourths* because they have different names, or different denominators. If you change $\frac{1}{2}$ to $\frac{2}{4}$, you can then add $\frac{2}{4}$ and $\frac{3}{4}$ because they have the *same name*, or the *same denominator*. The sum is $\frac{5}{4}$, or $1\frac{1}{4}$. Joe shoveled snow for $1\frac{1}{4}$ hr.

$$\begin{array}{r} \frac{1}{2} = \frac{2}{4} \\ \frac{3}{4} = \frac{3}{4} \\ \hline \frac{5}{4} = 1\frac{1}{4} \end{array}$$

2. Fractions having the same denominator, like $\frac{2}{4}$ and $\frac{3}{4}$, are said to have a *common denominator*. The common denominator is 4.

Change the fractions to fractions with the same denominator and add them. Check the work by going over it:

3. $\begin{array}{r} \frac{1}{2} \\ \frac{1}{4} \\ \hline \end{array}$ $\begin{array}{r} \frac{5}{8} \\ \frac{1}{2} \\ \hline \end{array}$ $\begin{array}{r} \frac{1}{4} \\ \frac{1}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{1}{4} \\ \frac{7}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{3}{4} \\ \frac{1}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{5}{8} \\ \frac{3}{4} \\ \hline \end{array}$ $\begin{array}{r} \frac{1}{2} \\ \frac{1}{8} \\ \hline \end{array}$

4. $\begin{array}{r} \frac{1}{4} \\ \frac{3}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{1}{2} \\ \frac{7}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{1}{2} \\ \frac{3}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{3}{4} \\ \frac{3}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{5}{8} \\ \frac{1}{4} \\ \hline \end{array}$ $\begin{array}{r} \frac{1}{2} \\ \frac{5}{8} \\ \hline \end{array}$ $\begin{array}{r} \frac{3}{4} \\ \frac{7}{8} \\ \hline \end{array}$

> To add fractions having different denominators, first change them to fractions having the same denominator.

1. In the addition examples below the fractions have different, or unlike, denominators. To add these fractions you must first change them to fractions with the same denominator. When the denominators are not the same, see if the smaller denominator can be changed to the larger denominator.

A	*B*	*C*
$4\frac{1}{2} = 4\frac{8}{16}$	$1\frac{1}{3} = 1\frac{2}{6}$	$3\frac{2}{5} = 3\frac{4}{10}$
$2\frac{3}{16} = 2\frac{3}{16}$	$3\frac{5}{6} = 3\frac{5}{6}$	$4\frac{3}{10} = 4\frac{3}{10}$
$6\frac{11}{16}$	$4\frac{7}{6} = 5\frac{1}{6}$	$7\frac{7}{10}$

In example *A*, the fractions are $\frac{1}{2}$ and $\frac{3}{16}$. In this case the smaller denominator 2 can be changed to the larger denominator 16 by multiplying 2 by 8. So you multiply both numerator and denominator of $\frac{1}{2}$ by 8 to change $\frac{1}{2}$ to $\frac{8}{16}$. In this case the common denominator is 16.

In example *B*, the fractions are $\frac{1}{3}$ and $\frac{5}{6}$. You can change the smaller denominator 3 to the larger denominator 6 by multiplying by 2. So multiply both numerator and denominator of $\frac{1}{3}$ by 2, which gives $\frac{2}{6}$.

In example *C*, by what number do you multiply the smaller denominator 5 to change it to 10? Then multiply both numerator and denominator of $\frac{2}{5}$ by that number.

Add. First change the fractions to fractions with like denominators. Check the work by going over it:

2. $3\frac{2}{3}$	$2\frac{1}{3}$	$3\frac{1}{2}$	$2\frac{8}{10}$	$3\frac{1}{2}$	$2\frac{5}{12}$	$3\frac{5}{6}$
$4\frac{1}{6}$	$1\frac{1}{12}$	$2\frac{6}{10}$	$\frac{1}{2}$	$\frac{1}{12}$	$2\frac{1}{6}$	$4\frac{1}{12}$
3. $5\frac{1}{5}$	$4\frac{1}{8}$	$5\frac{1}{4}$	$5\frac{2}{3}$	$1\frac{1}{5}$	$2\frac{1}{2}$	$4\frac{2}{3}$
$3\frac{1}{10}$	$\frac{1}{16}$	$1\frac{5}{16}$	$3\frac{5}{12}$	$2\frac{9}{10}$	$3\frac{9}{16}$	$\frac{11}{12}$
4. $2\frac{7}{12}$	$6\frac{1}{5}$	$3\frac{1}{16}$	$4\frac{1}{2}$	$6\frac{1}{3}$	$1\frac{9}{16}$	$9\frac{7}{12}$
$4\frac{5}{6}$	$1\frac{7}{10}$	$\frac{7}{8}$	$2\frac{4}{10}$	$\frac{7}{12}$	$2\frac{1}{4}$	$1\frac{1}{2}$

124 HOW MANY YARDS DID SHE USE?

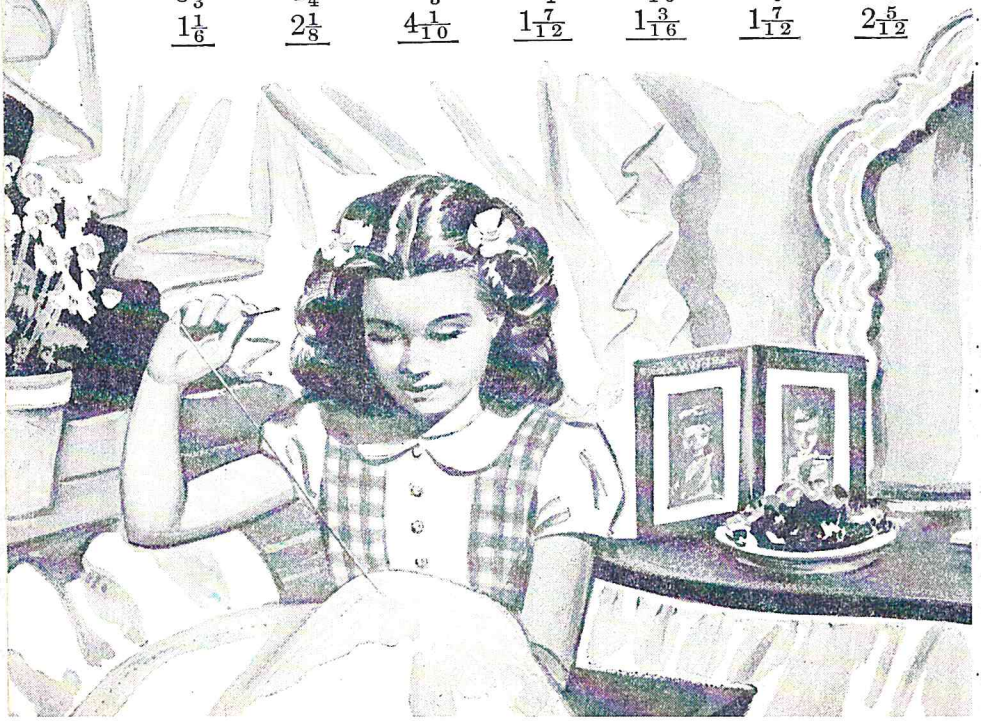
1. Margaret is fixing up her room. She used $3\frac{1}{2}$ yd. of material for curtains, $1\frac{5}{8}$ yd. for the dresser, and $\frac{5}{8}$ yd. for the pillow. How many yards of material has she used?

The common denominator is 8. Change $\frac{1}{2}$ to $\frac{4}{8}$; then add as shown at the right. The sum is $4\frac{14}{8}$ which reduces to $5\frac{3}{4}$. Margaret used $5\frac{3}{4}$ yd. of material. Check the work by going over it.

$$\begin{array}{rcl} 3\frac{1}{2} & = & 3\frac{4}{8} \\ 1\frac{5}{8} & = & 1\frac{5}{8} \\ \frac{5}{8} & = & \frac{5}{8} \\ \hline & & 4\frac{14}{8} = 5\frac{6}{8} = 5\frac{3}{4} \end{array}$$

Add. Check the work by going over it:

2.	$3\frac{5}{6}$	$2\frac{3}{4}$	$6\frac{2}{3}$	$4\frac{3}{4}$	$2\frac{1}{2}$	$1\frac{3}{4}$	$4\frac{1}{4}$
	$2\frac{1}{2}$	$3\frac{3}{8}$	$4\frac{5}{6}$	$3\frac{1}{12}$	$\frac{3}{4}$	$2\frac{8}{16}$	$2\frac{11}{12}$
3.	$3\frac{5}{8}$	$2\frac{1}{5}$	$\frac{7}{8}$	$3\frac{11}{12}$	$2\frac{1}{2}$	$4\frac{3}{4}$	$3\frac{3}{8}$
	$2\frac{15}{16}$	$3\frac{3}{10}$	$1\frac{5}{16}$	$2\frac{3}{4}$	$3\frac{7}{10}$	$2\frac{7}{12}$	$3\frac{1}{16}$
4.	$4\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$5\frac{1}{2}$	$2\frac{1}{16}$	$3\frac{1}{2}$	$4\frac{1}{2}$
	$3\frac{1}{3}$	$4\frac{1}{4}$	$1\frac{3}{5}$	$3\frac{1}{4}$	$3\frac{3}{16}$	$2\frac{1}{6}$	$3\frac{1}{3}$
	$1\frac{1}{6}$	$2\frac{1}{8}$	$4\frac{1}{10}$	$1\frac{7}{12}$	$1\frac{3}{16}$	$1\frac{7}{12}$	$2\frac{5}{12}$



1. Count by 6's from 52 to 88; from 110 to 146.
2. Count by 9's from 12 to 93; from 109 to 154.

Add 6 to each number. Add 7; add 8; add 9:

3.	28	52	67	83	46	71	95	19
4.	85	37	14	48	22	29	73	66
5.	44	13	45	89	36	38	57	78

6. Tell how much change you should get from 50¢ if you spend 32¢. What coins might you get in change?
7. How many inches are there in $\frac{1}{4}$ yd.? in $\frac{3}{4}$ yd.?
8. How many quarts are there in 1 pk.? in $\frac{1}{2}$ pk.?
9. How many quarts are there in 1 gal.? in $\frac{3}{4}$ gal.?
10. If 3 oranges cost 10¢, what is the cost of 1 orange?
11. How many weeks and days are there in November?
12. From 2:15 P.M. until 10:35 P.M. is how many hours and minutes?
13. How many 6-cent pencils can you buy with a quarter?
14. Reduce to lowest terms: $\frac{4}{8}$, $\frac{5}{10}$, $\frac{5}{15}$, $\frac{6}{9}$, $\frac{10}{20}$, $\frac{24}{36}$, $\frac{24}{48}$.
15. Change to mixed numbers: $\frac{5}{2}$, $\frac{7}{3}$, $\frac{9}{4}$, $\frac{6}{5}$, $\frac{11}{3}$.
16. Find $\frac{3}{4}$ of each number: 8, 12, 20, 32, 28, 16.
17. Add $\frac{1}{2}$ and $\frac{1}{2}$; $\frac{1}{3}$ and $\frac{2}{3}$; $\frac{3}{8}$ and $\frac{3}{8}$; $\frac{1}{5}$ and $\frac{4}{5}$.
18. Subtract $\frac{1}{3}$ from $\frac{2}{3}$; $\frac{1}{4}$ from $\frac{3}{4}$; $\frac{3}{8}$ from $\frac{7}{8}$; $\frac{1}{16}$ from $\frac{7}{16}$.
19. Multiply each number by 10: 45, 58, 73, 81, 94.

Find these sums:

20.	$8 + 6 + 3$	$3 + 4 + 8$	$1 + 4 + 2 + 7$
21.	$2 + 4 + 9$	$1 + 7 + 4$	$3 + 1 + 5 + 6$
22.	$4 + 6 + 7$	$8 + 3 + 2$	$5 + 2 + 6 + 4$

Make a good question for each problem so that all the numbers in it are used. Then find the answer to your question:

1. Mr. Lane left Newton by train at 4:07 P.M. and arrived in Chicago at 10:45 P.M. the same day.

2. Jack has 85¢ to spend for films for his camera. The films sell at 35¢ a roll.

3. Ann needs 5 balls of yarn to knit a sweater. The yarn costs 49¢ a ball.

4. When Mr. Ford drives his car in the country, he averages 35 mi. per hour. Yesterday he drove his car 3 hr. in the country.

5. At the school fair Betty sold popcorn balls for 5¢ each. When they were all sold she had $1.80.

6. In February Bill earned $3.85 the first week, $2.60 the second week, $4.05 the third week, and $2.90 the fourth.

7. Tom weighs $62\frac{1}{2}$ lb. and Jack weighs $58\frac{1}{2}$ lb.

8. Margaret gave the clerk a half dollar to pay for 2 qt. of milk at 15¢ a quart.

9. In the auditorium of our school there are 25 rows of seats. Each row has 24 seats in it.

10. When Alice opened her bank yesterday she had 11 quarters, 14 dimes, 8 nickels, and 31 pennies.

11. It took Henry from 4 o'clock to 6 o'clock to rake the leaves in Mr. White's yard and burn them. Mr. White paid Henry 35¢ an hour for his work.

12. Joe took in $8.75 for the tickets he sold for the ball game. Each ticket sold for $.35.

13. On a bicycle trip to Long Lake, some boys rode 15 mi. in 2 hr.

14. The train due to arrive at 5:15 P.M. did not arrive until 5:48 P.M.

1. Beginning with 5, write the numbers by 4's to 49.
2. Beginning with 7 write the numbers by 6's to 55.
3. Find the sum of 2486, 3928, 456, and 1735.
4. Find the total of $12.56, $8.45, $23.50, and $9.57.
5. Find the difference between $320.00 and $165.74.
6. Write the number that is 1250 more than 5648.
7. Write the number that is 657 less than 4280.
8. Find the average of 238, 326, 195, 207, and 319.
9. Find the product of 247 and 385; of 198 and 732.
10. What is the quotient when you divide 1875 by 25?

Add and check the work:

11.

12	26	76	79	22	63	83	98
35	44	57	46	89	35	37	33
64	55	84	83	44	74	48	25
97	78	69	69	56	19	57	86
83	96	72	35	98	92	25	17
49	13	25	28	33	57	44	59

Subtract and check the work:

12.

5026	3163	6074	5290	6316	8251
3858	1226	3637	2582	5645	7287

Multiply and check the work:

13.

278	548	629	409	4807	3738
35	429	384	267	54	68

Divide and check the work:

14. $33\overline{)528}$ $41\overline{)984}$ $25\overline{)2200}$ $53\overline{)4467}$ $72\overline{)2664}$

15. $22\overline{)689}$ $32\overline{)896}$ $62\overline{)2649}$ $44\overline{)3261}$ $31\overline{)2670}$

SUBTRACTING UNLIKE FRACTIONS

1. Jack swam across the pool in $47\frac{3}{10}$ sec. It took George $51\frac{1}{2}$ sec. How much less time did it take Jack to swim across the pool than George?

The fractions $\frac{3}{10}$ and $\frac{1}{2}$ have different denominators. Before you can subtract the fractions, you must change them to fractions with like denominators. Change $\frac{1}{2}$ to $\frac{5}{10}$. Then subtract. Reduce the fraction in the answer to lowest terms. Jack's time was $4\frac{1}{5}$ sec. less than George's time.

$$\begin{array}{rcl} 51\frac{1}{2} & = & 51\frac{5}{10} \\ \underline{47\frac{3}{10}} & = & \underline{47\frac{3}{10}} \\ & & 4\frac{2}{10} = 4\frac{1}{5} \end{array}$$

> To subtract fractions with different denominators, change them to fractions with like denominators.

Subtract. Check the work by going over it:

2.	$4\frac{3}{4}$	$2\frac{7}{8}$	$3\frac{1}{2}$	$5\frac{1}{4}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$1\frac{11}{16}$
	$2\frac{1}{2}$	$1\frac{1}{2}$	$2\frac{1}{6}$	$3\frac{1}{12}$	$1\frac{1}{10}$	$2\frac{1}{16}$	$\frac{1}{4}$
3.	$1\frac{7}{8}$	$3\frac{1}{2}$	$5\frac{9}{10}$	$3\frac{5}{12}$	$4\frac{5}{8}$	$2\frac{3}{4}$	$2\frac{7}{10}$
	$\frac{1}{4}$	$3\frac{1}{4}$	$3\frac{1}{5}$	$\frac{1}{4}$	$3\frac{1}{16}$	$2\frac{5}{12}$	$1\frac{1}{5}$
4.	$3\frac{2}{5}$	$2\frac{5}{6}$	$6\frac{1}{2}$	$7\frac{5}{6}$	$5\frac{3}{5}$	$4\frac{9}{16}$	$3\frac{3}{4}$
	$2\frac{3}{10}$	$2\frac{1}{3}$	$4\frac{1}{12}$	$3\frac{1}{12}$	$2\frac{1}{10}$	$2\frac{1}{2}$	$2\frac{7}{16}$
5.	$2\frac{3}{4}$	$4\frac{4}{5}$	$3\frac{7}{8}$	$6\frac{7}{12}$	$5\frac{11}{16}$	$3\frac{3}{10}$	$4\frac{11}{12}$
	$\frac{3}{8}$	$2\frac{3}{10}$	$3\frac{3}{16}$	$2\frac{1}{3}$	$2\frac{3}{8}$	$2\frac{1}{5}$	$2\frac{1}{6}$

1. Jack started to ride $1\frac{3}{4}$ mi. to school on his bicycle. After he had gone $\frac{1}{2}$ mi. he got a flat tire and didn't have time to fix it; so he walked the rest of the way. How far did he have to walk to get to school?

2. At the school field day Joe's time for the 100-yard dash was $16\frac{3}{4}$ sec. Bill's time was $15\frac{1}{2}$ sec. How much faster was Bill's time than Joe's?

3. Elizabeth wants to practice her music lesson $\frac{3}{4}$ hr. today. She practiced $\frac{1}{2}$ hr. after breakfast. How much longer should she practice today?

4. Mary's mother bought $3\frac{3}{4}$ yd. of material for a dress and an apron for Mary. The dress takes $2\frac{5}{8}$ yd. How much material is there for the apron?

Subtract. Check by going over the work:

5.	$\frac{1}{5}$	$4\frac{5}{6}$	$9\frac{1}{2}$	$4\frac{3}{5}$	$7\frac{9}{16}$	$5\frac{15}{16}$	$8\frac{9}{10}$
	$\frac{1}{10}$	$1\frac{1}{2}$	$3\frac{7}{16}$	$2\frac{3}{10}$	$4\frac{1}{8}$	$\frac{1}{2}$	$7\frac{1}{2}$
6.	$\frac{3}{4}$	$6\frac{2}{3}$	$8\frac{3}{8}$	$5\frac{7}{10}$	$2\frac{5}{12}$	$9\frac{1}{2}$	$4\frac{2}{3}$
	$\frac{5}{16}$	$2\frac{1}{9}$	$6\frac{1}{16}$	$2\frac{2}{5}$	$\frac{1}{3}$	$7\frac{3}{10}$	$1\frac{1}{12}$
7.	$\frac{4}{5}$	$7\frac{3}{8}$	$1\frac{2}{3}$	$8\frac{2}{3}$	$7\frac{3}{4}$	$5\frac{3}{4}$	$9\frac{1}{2}$
	$\frac{1}{10}$	$5\frac{1}{4}$	$\frac{7}{12}$	$1\frac{1}{6}$	$2\frac{5}{8}$	$3\frac{11}{16}$	$2\frac{3}{8}$
8.	$\frac{1}{3}$	$6\frac{5}{6}$	$5\frac{11}{12}$	$9\frac{5}{8}$	$6\frac{13}{16}$	$6\frac{4}{5}$	$8\frac{9}{10}$
	$\frac{1}{12}$	$4\frac{2}{3}$	$4\frac{5}{6}$	$6\frac{7}{16}$	$6\frac{5}{8}$	$3\frac{3}{10}$	$3\frac{2}{5}$
9.	$\frac{5}{6}$	$3\frac{3}{4}$	$7\frac{5}{8}$	$3\frac{9}{10}$	$9\frac{11}{12}$	$8\frac{1}{2}$	$2\frac{15}{16}$
	$\frac{1}{3}$	$2\frac{1}{2}$	$\frac{5}{16}$	$3\frac{1}{5}$	$4\frac{1}{6}$	$4\frac{1}{16}$	$2\frac{7}{8}$
10.	$\frac{1}{2}$	$4\frac{1}{3}$	$9\frac{7}{10}$	$8\frac{5}{12}$	$3\frac{13}{16}$	$6\frac{7}{8}$	$5\frac{5}{6}$
	$\frac{1}{8}$	$2\frac{1}{6}$	$6\frac{1}{5}$	$5\frac{1}{4}$	$1\frac{1}{2}$	$5\frac{3}{4}$	$5\frac{7}{12}$

Add. Check by going over the work:

1.	$\frac{1}{6}$	$\frac{1}{16}$	$4\frac{1}{2}$	$1\frac{5}{6}$	$8\frac{1}{12}$	$5\frac{1}{3}$	$2\frac{1}{4}$
	$\frac{1}{6}$	$\frac{15}{16}$	$2\frac{1}{10}$	$7\frac{5}{12}$	$3\frac{7}{12}$	$\frac{5}{6}$	$1\frac{3}{8}$
2.	$\frac{3}{8}$	$\frac{1}{6}$	$1\frac{5}{12}$	$4\frac{3}{4}$	$2\frac{9}{16}$	$1\frac{1}{4}$	$9\frac{7}{8}$
	$\frac{3}{8}$	$\frac{1}{12}$	$6\frac{1}{12}$	$4\frac{5}{16}$	$7\frac{1}{16}$	$1\frac{5}{8}$	$2\frac{1}{8}$
3.	$\frac{3}{4}$	$\frac{1}{2}$	$2\frac{1}{12}$	$4\frac{1}{2}$	$1\frac{3}{10}$	$6\frac{2}{5}$	$1\frac{1}{2}$
	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{12}$	$1\frac{1}{3}$	$3\frac{1}{10}$	$2\frac{1}{5}$	$4\frac{1}{8}$
	$\frac{3}{4}$	$\frac{7}{16}$	$1\frac{7}{12}$	$\frac{11}{12}$	$1\frac{1}{10}$	$8\frac{1}{5}$	$5\frac{5}{8}$
4.	$\frac{3}{8}$	$\frac{1}{2}$	$3\frac{4}{5}$	$6\frac{1}{16}$	$2\frac{3}{4}$	$7\frac{3}{8}$	$4\frac{2}{5}$
	$\frac{1}{2}$	$\frac{1}{5}$	$4\frac{1}{2}$	$2\frac{5}{8}$	$2\frac{1}{16}$	$\frac{7}{8}$	$\frac{3}{5}$
	$\frac{1}{4}$	$\frac{9}{10}$	$\frac{7}{10}$	$5\frac{5}{16}$	$2\frac{1}{8}$	$3\frac{1}{4}$	$\frac{3}{5}$

Subtract. Check by going over the work:

5.	$\frac{1}{2}$	$\frac{9}{10}$	$4\frac{11}{12}$	$5\frac{2}{5}$	$4\frac{5}{6}$	$3\frac{3}{4}$	$8\frac{1}{3}$
	$\frac{1}{8}$	$\frac{4}{5}$	$2\frac{2}{3}$	$3\frac{1}{10}$	$1\frac{7}{12}$	$1\frac{3}{4}$	$2\frac{1}{6}$
6.	$\frac{5}{8}$	$\frac{7}{16}$	$8\frac{5}{6}$	$9\frac{7}{12}$	$5\frac{3}{4}$	$6\frac{3}{4}$	$9\frac{4}{5}$
	$\frac{1}{8}$	$\frac{3}{16}$	$3\frac{5}{12}$	8	$4\frac{7}{12}$	$6\frac{1}{4}$	$1\frac{1}{5}$
7.	$\frac{7}{8}$	$\frac{5}{12}$	$7\frac{7}{8}$	$5\frac{11}{12}$	$8\frac{9}{16}$	$8\frac{7}{8}$	$7\frac{5}{6}$
	$\frac{3}{8}$	$\frac{1}{6}$	$1\frac{5}{16}$	$1\frac{3}{4}$	$7\frac{3}{16}$	4	$2\frac{5}{6}$
8.	$\frac{5}{6}$	$\frac{3}{4}$	$9\frac{15}{16}$	$4\frac{7}{10}$	$6\frac{7}{12}$	$7\frac{3}{4}$	$6\frac{1}{2}$
	$\frac{2}{3}$	$\frac{1}{12}$	$5\frac{5}{8}$	$3\frac{1}{10}$	$1\frac{1}{4}$	$4\frac{1}{8}$	5
9.	$\frac{5}{8}$	$\frac{2}{3}$	$8\frac{9}{10}$	$2\frac{11}{12}$	$9\frac{1}{2}$	$4\frac{5}{8}$	$6\frac{5}{6}$
	$\frac{1}{2}$	$\frac{5}{12}$	$6\frac{2}{5}$	$2\frac{1}{4}$	$2\frac{3}{10}$	$1\frac{1}{4}$	$3\frac{1}{6}$

Tell whether you add, subtract, multiply, or divide to work each problem. If there are two steps, tell what you do for each step:

1. You know the distance between two cities and the number of hours you rode in a car to make the trip. How do you find the average speed of the car per hour?

2. You know the cost of each of four things and also how many boys will share the total cost equally. How do you find each boy's share of the cost?

3. You know the price of each of two cameras. How do you find the difference in their prices?

4. You know the cost of a movie ticket, the number of tickets you buy, and the amount of money you give the man. How do you find the change you should get?

5. You know Bill's age and how many years older his brother Henry is. How do you find Henry's age?

6. You know how many yards of wire netting you need for a chicken yard. If the netting is sold by the foot, how do you find the number of feet of netting you need?

7. You know the price of a quart of milk and the number of quarts your mother buys each day. You also know that she buys the same number of quarts of milk every day. How do you find the cost of milk for a week?

8. You know the amount of money you earned for each job you did last week. How do you find the total amount you earned last week?

9. You know how many yards of ribbon you bought. You also know how much of it you will use on a dress. How do you find how much ribbon you will have left?

10. You know how many tickets have been printed for the puppet show. You also know how many children will sell tickets. How do you find the number of tickets each child should sell?

Add up. Check the work by adding down:

1.	263	278	225	369	219	256	240
	435	582	343	603	240	477	308
	146	206	419	775	465	106	297
	493	115	542	136	310	385	684
	255	525	162	117	138	417	751

Subtract. Check the work by adding:

2.	4768	7139	1000	3239	8003
	2859	6269	753	1266	4009
3.	6785	9524	9114	7000	5296
	906	2148	3136	5165	609

Multiply. Check the work by going over it:

4.	596	427	635	1728	347
	63	174	407	36	320
5.	423	789	819	2465	536
	89	459	208	52	190

Divide. Check the work by multiplying:

6.	33)1386	21)1307	62)3299	23)1173	84)7145
7.	22)1166	54)1735	75)4875	31)1426	43)1505
8.	35)1470	62)2391	32)1440	41)3075	83)3000
9.	72)2448	61)4589	44)2376	65)3380	34)1122
10.	53)3450	45)1530	81)5913	42)3108	51)1634

1. Arthur had a board $3\frac{3}{4}$ ft. long. He sawed off a piece $1\frac{1}{4}$ ft. long. How long was the piece that was left?

2. A Boy Scout troop with 32 members hired a bus to take them to camp. It cost $8.00 to hire the bus. If the boys divided the cost equally, how much did each one pay?

3. Ann had these marks on five papers in arithmetic: 88, 92, 85, 83, 87. What was Ann's average mark?

4. John's grandfather sent the family a turkey for Thanksgiving and another for Christmas. He said one weighed $11\frac{1}{2}$ lb. and the other weighed $15\frac{1}{4}$ lb. How many pounds of turkey did John's grandfather send?

5. Joe likes to read a science magazine. If he buys a copy each month, it costs 35¢ a copy. How much could he save by getting a year's subscription for $3.00?

6. The water in our swimming pool is $8\frac{1}{2}$ ft. deep at one end and $2\frac{1}{4}$ ft. deep at the other end. How much deeper is the water at one end than at the other?

7. Our cooking class made 43 doz. cookies and sold them for 30¢ a dozen. The cost of making the cookies was $4.39. How much money did we make?

8. For his birthday Jack got $5.00. He wants to buy 2 rabbits at $.65 each and 25 ft. of wire for a rabbit pen. The wire costs $.14 a foot. How much money will Jack have left?

9. We are making plans for a large party at school. There will be 152 girls, 139 boys, and 9 teachers at the party. Will we need 3 packages or 4 packages of paper napkins if there are 80 napkins in a package?

1. John can save 25¢ a week. How many weeks will it take him to save $19.50? Is that more or less than a year?

2. Bill and Tom sold Christmas trees and made $4.50 in all. After they divided the money equally Bill spent $.35. How much money did Bill have left?

3. Friday afternoon the temperature was 70°. By Saturday morning it had dropped to 47°. How many degrees colder was it on Saturday morning?

4. If 8 boys collect 100 lb. of old newspapers all together, what is the average number of pounds collected per boy? Write the remainder as a fraction in the quotient and reduce it to lowest terms.

5. Betty bought $\frac{3}{8}$ yd. of muslin to make a small rag doll and $\frac{5}{8}$ yd. of muslin for a large rag doll. If she paid $.35 a yard for the muslin, how much change did she get from a half dollar?

6. What is the cost of 10 oz. of chopped meat at $.40 a pound? at $.48 a pound?

7. Mr. Wilson bought 2 boxes of oranges each containing 150 oranges. He sold all of them except 11 oranges that spoiled. How much did he get for the oranges if he sold them at 5¢ each? How much did he make if he paid $4.25 for each box of oranges?

8. This week Bill sold $2\frac{1}{2}$ doz. eggs to Mrs. Brown and $1\frac{1}{2}$ doz. to Mrs. Ford. Then he had $1\frac{1}{6}$ doz. left. How many dozen eggs did Bill get this week?

9. George has $2.00 a week to spend for carfare and for lunch at school. He can keep any money that is left. At the end of 5 school days how much money has he left if he pays 12¢ a day for carfare and 25¢ a day for lunch?

10. In her purse Margaret has 2 quarters, 7 dimes, 11 nickels, and 13 pennies. How much money has she?

Read the statements below and tell the correct word to put in each space. Do not write in the spaces:

1. In an example in division, the number by which you divide is called the _____; the number that is divided is called the _____; the answer is called the _____. If there is anything left over, it is called the _____.

2. In an example in subtraction, the number to be subtracted is called the _____; the number from which you subtract is called the _____; the answer is called the _____ or the _____.

3. In a fraction, the number above the line is called the _____; the number below the line is called the _____. Both numbers are called the _____ of the fraction.

4. When an apple is divided into four equal parts, each part is called _____ _____ of the apple.

5. A whole number followed by a proper fraction is called a _____ _____.

6. The money you receive from the clerk after you pay for a purchase is called _____.

7. In writing dollars and cents, the dot that separates the dollars from the cents is called the _____ _____.

8. In an example in multiplication, the number that is multiplied is called the _____; the number by which you multiply is called the _____; the answer is called the _____.

9. To find the difference between two numbers, you _____.

10. In an example in addition, the answer is called the _____.

11. When the speed per hour of an automobile is multiplied by the number of hours it travels, the answer represents the _____.

$\frac{7}{8}$	$\frac{7}{16}$	$\frac{3}{4}$
$\frac{9}{16}$	$\frac{11}{16}$	$\frac{13}{16}$
$\frac{5}{8}$	$\frac{15}{16}$	$\frac{1}{2}$

1. This figure is a magic square. Each column, each row, and each diagonal line has the same sum. For example, $\frac{7}{8} + \frac{7}{16} + \frac{3}{4} = 2\frac{1}{16}$; $\frac{7}{8} + \frac{9}{16} + \frac{5}{8} = 2\frac{1}{16}$; $\frac{7}{8} + \frac{11}{16} + \frac{1}{2} = 2\frac{1}{16}$. There are 5 other sums that are each equal to $2\frac{1}{16}$. Find the numbers in each of these 5 sums and add them. Is the sum $2\frac{1}{16}$?

When the numbers in a magic square are fractions, you must change the fractions to fractions having a common denominator before you can add them. Always reduce the sum to a mixed number. If there is a fraction in the sum, reduce it to lowest terms. Then you can tell whether the 8 sums in each square are all alike.

In each square below add the numbers in each row, in each column, and along each diagonal. Do you get 8 sums alike in each square? If you do, it is a magic square:

2

$\frac{9}{16}$	$\frac{1}{2}$	$\frac{13}{16}$
$\frac{7}{8}$	$\frac{5}{8}$	$\frac{3}{8}$
$\frac{7}{16}$	$\frac{3}{4}$	$\frac{11}{16}$

3

$\frac{1}{4}$	$\frac{11}{16}$	$\frac{3}{8}$
$\frac{9}{16}$	$\frac{7}{16}$	$\frac{5}{16}$
$\frac{1}{2}$	$\frac{3}{16}$	$\frac{5}{8}$

4

$\frac{7}{16}$	$\frac{3}{8}$	$\frac{11}{16}$
$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{4}$
$\frac{5}{16}$	$\frac{5}{8}$	$\frac{9}{16}$

5

$\frac{1}{8}$	$\frac{7}{16}$	$\frac{3}{8}$
$\frac{9}{16}$	$\frac{5}{16}$	$\frac{1}{16}$
$\frac{1}{4}$	$\frac{3}{16}$	$\frac{1}{2}$

6

$\frac{9}{16}$	$\frac{1}{16}$	$\frac{1}{2}$
$\frac{5}{16}$	$\frac{3}{8}$	$\frac{7}{16}$
$\frac{1}{4}$	$\frac{11}{16}$	$\frac{3}{16}$

7

$\frac{3}{16}$	$\frac{15}{16}$	$\frac{3}{8}$
$\frac{11}{16}$	$\frac{1}{2}$	$\frac{5}{16}$
$\frac{5}{8}$	$\frac{1}{16}$	$\frac{13}{16}$

1. How many zeros are there in the number 8 million?

2. How many zeros are there in the number 5 thousand?

3. Say the next three numbers after 999,998.

4. Add 6 to each number below. Add 7; 8; 9:

88	96	55	79	62	17	64	28
73	19	94	46	25	58	37	36
67	85	72	18	54	26	49	33

5. Count by 7's from 38 to 87; from 109 to 144.

6. Count by 8's from 19 to 83; from 206 to 254.

7. Count by 9's from 11 to 74; from 117 to 162.

8. Count the change as a clerk might do if you buy a book for $1.59 and pay for it with a 5-dollar bill.

9. Tell what coins you would give as change for $1.00 on each of these purchases:

45¢ 83¢ 67¢ 19¢ 32¢ 55¢ 70¢

10. Find the sum of 9, 6, 8, 5, 4, and 7.

11. How many pounds are there in $\frac{1}{2}$ ton? in $\frac{1}{4}$ ton?

12. How many bushels are there in 8 pk.?

13. What part of a gallon is 2 qt.? 3 qt.?

14. Change to mixed numbers: $\frac{4}{3}$, $\frac{5}{2}$, $\frac{10}{4}$, $\frac{8}{3}$, $\frac{11}{5}$.

15. Reduce to lowest terms: $\frac{2}{4}$, $\frac{3}{6}$, $\frac{2}{8}$, $\frac{8}{12}$, $\frac{9}{12}$.

16. Betty buys 2 pencils for 5¢. What is the cost of 1 pencil?

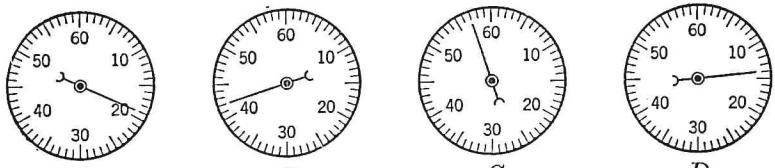
17. Bill walks at the rate of 3 mi. an hour. How far can he walk in 2 hr.?

18. Find the cost of $\frac{5}{8}$ lb. of cheese at 40¢ a pound.

19. What is the weight of two fish if one fish weighs $2\frac{1}{2}$ lb. and the other fish weighs $1\frac{1}{2}$ lb.?

20. Find the difference between $6\frac{3}{4}$ and $2\frac{1}{2}$.

1. Figures *A*, *B*, *C*, *D* below show the second dial of a watch. There is only one hand on the dial which is called the second hand; it goes around the dial in 1 minute, or 60 seconds. The hand moves so fast that it is not easy to read the exact second but in *A* it is easy to see that the hand is close to 20 sec. In *A* the hand is actually pointing to 19 which is very close to 20. In this case we often say that the time on the second dial is "about 20 sec." In *A* you see that the hand is closer to 20 than it is to 10; in this case you would never think of calling it "about 10 sec."



A *B* *C* *D*

2. In *B* the hand is pointing to 42, which is close to 40. You see that the hand is much closer to 40 than it is to 50. In this case the time on the second dial is "about 40 sec." When you read the time as "about 40 sec.," you are giving it to the *nearest 10 seconds.*

3. In *C* the hand is pointing to 57. Is the hand closer to 50 or 60? Is this read "about 50 sec." or "about 60 sec."? Since 60 sec. is 1 min., tell another way to read the dial in *C*.

4. In *D* the hand is pointing to 14. Is the hand closer to 10 or to 20? In this case, if you give the time to the *nearest* 10 sec., is it "about 10 sec." or "about 20 sec?"

5. Suppose the second hand is actually pointing to the numbers below. In each case give the number of seconds to the nearest 10 sec. For the first number, give the answer as "about 40 sec.": 38, 52, 31, 49, 23, 37, 44, 17, 46.

Reading the second dial to the nearest 10 seconds.

1. Yesterday Joe earned 85¢. How many movie tickets can he buy for 85¢ if the tickets cost 38¢ each? Will Joe have any money left over?

You must find how many 38's there are in 85. Since 38 is close to 40, the number of 38's in 85 is about the same as the number of 40's in 85. So think of the divisor as 40 instead of 38. This means that you will divide by 4 instead of 3 when you estimate the quotient figure. Think "8 ÷ 4 = 2." Multiply 38 by 2, which gives 76. Subtract 76 from 85, which leaves 9. Since 9 is less than 38, 2 is the right quotient. Joe can buy 2 tickets and will have 9¢ left.

```
      2
38)85
   76
    9
```

2. Divide 451 by 49.

Since 49 is close to 50, divide by 5 instead of 4 to estimate the quotient figure. Think "45 ÷ 5 = 9." Multiply 49 by 9 which gives 441. Subtract 441 from 451. Is the remainder less than the divisor? Is 9 the right quotient?

```
      9
49)451
   441
    10
```

3. In ex. 2, the divisor 49 is closer to 50 than to 40. So you divide by 5 instead of 4 to estimate the quotient figure. Notice that 5 is 1 *more* than the first figure of 49.

4. If the divisor were 27, you would divide by 3 to estimate the quotient figure because 27 is closer to 30 than to 20. Notice that 3 is 1 *more* than the first figure of 27. If the divisor were 76, you would divide by 8 to estimate the quotient figure. Tell why.

5. By what number do you divide to estimate the quotient figure if the divisor is 58, 69, 47, 26, 88, 37, 89, 66?

When a two-figure divisor ends in 6, 7, 8, or 9, divide by 1 more than the first figure of the divisor to estimate each quotient figure.

1. Last fall 39 Boy Scouts in Meadville planted 5000 tiny pine trees along a new road. How many pine trees, on the average, did each boy plant?

Since 39 is almost 40, there are about as many 39's in 5000 as there are 40's in 5000. Think "There is one 4 in 5." Write 1 in the quotient. Multiply 39 by 1, which gives 39. Write 39 under 50 and subtract. The remainder is 11 which is less than 39. Bring down the next figure of the dividend.

To get the second quotient figure, think "There are two 4's in 11." Write 2 in the quotient. Multiply 39 by 2, which gives 78. Write 78 under 110 and subtract. Is the remainder less than the divisor? Bring down the next figure.

```
     128
39)5000
    39
    110
     78
     320
     312
       8
```

To get the third quotient figure, think "There are eight 4's in 32." Finish the work. The quotient is 128 and the remainder is 8. Each boy planted an average of 128 trees and there were 8 trees left over. Eight boys could each plant 1 extra tree.

Divide and check. Divide by 1 more than the first figure of the divisor to estimate each quotient figure:

2. 28)681 37)1393 56)1481 66)21475 48)11399

3. 29)823 47)3027 26)6100 58)42585 36)13241

4. 18)301 57)7712 78)1652 49)27594 77)33274

5. 26)641 18)1021 27)6335 87)10800 57)30697

6. 19)615 46)1177 59)2082 68)57271 86)20911

7. 38)541 19)1411 88)4897 79)15663 28)18025

8. 59)485 46)3165 57)4308 48)25545 29)12343

Here are three sets of division examples. If you get all the examples right in the first set, you do not need to do the other two sets. If you need more practice, do Sets II and III.

Divide and check the work:

SET I

1.	28)161	76)4289	29)1896	47)18126	89)66150
2.	46)265	27)1261	68)1264	37)12081	28)12785
3.	38)139	69)2516	49)3680	38)24603	77)48068
4.	19)121	36)1320	58)4902	47)35452	86)46717
5.	66)169	77)2713	19)1800	48)15663	59)19783

SET II

6.	47)354	26)1220	78)4475	56)31781	88)32324
7.	56)255	67)3847	27)1022	68)63529	39)25475
8.	78)295	28)2110	39)1061	87)40419	69)64322
9.	37)505	59)1382	48)3288	57)42930	96)28541

SET III

10.	26)670	79)2014	86)5037	66)36131	38)16084
11.	58)385	37)2429	39)1379	27)10230	76)64841
12.	36)845	19)1835	88)5915	59)49210	18)14020
13.	49)256	87)5860	29)1632	47)11167	46)10780

FUN IN WINTER

1. Bill and Ned live in Mountain View where many people go for winter sports. The boys know how to skate, ski, and sail an iceboat. Snow usually comes by Nov. 15 and stays on the ground until about Mar. 15. About how many months is there snow on the ground?

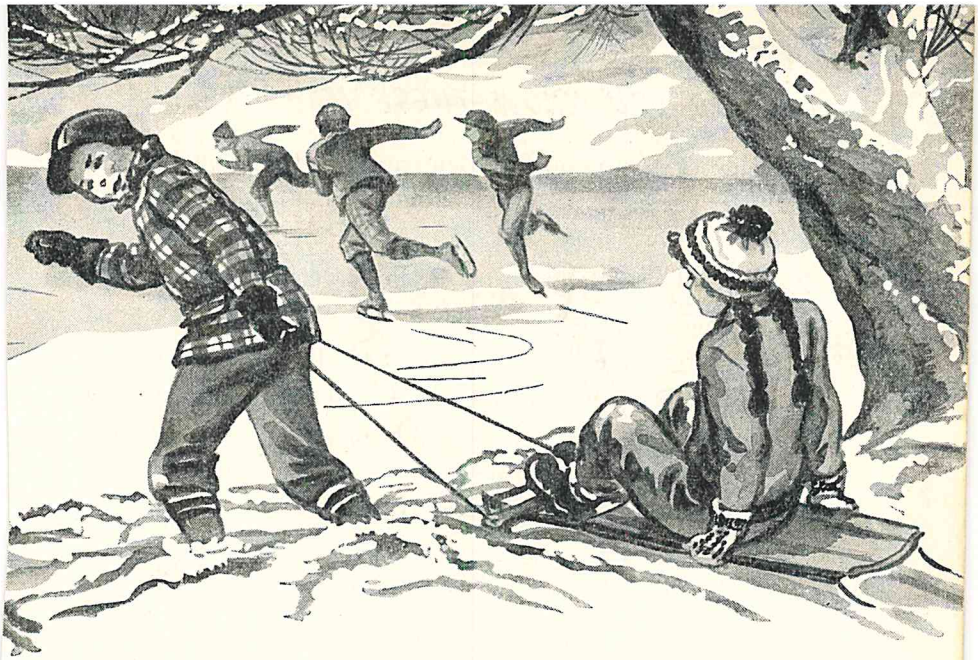
2. Last winter the amounts of snow that fell at Mountain View during 5 winter months were: Nov., 2 in.; Dec., $3\frac{3}{4}$ in.; Jan., $4\frac{1}{2}$ in.; Feb., $7\frac{1}{4}$ in.; Mar., $5\frac{1}{2}$ in. What was the average number of inches per month?

3. Bill's brother has an iceboat on the lake. With a good wind he can sail 1 mi. in 80 sec. How many feet is this per second? how many feet per minute? Is this about $\frac{1}{2}$ mi. per minute or $\frac{3}{4}$ mi. per minute?

4. The bobsled run at Mountain View is 2640 yd. long. How many feet long is it? Is this more or less than 1 mi.?

5. The boys watched a bobsled with 4 men on it as it came down the run in a race. It went at a speed of a mile in 1 min. 20 sec. How many feet was this per second? Change 1 min. 20 sec. to seconds.

6. Ned said, "When I grow up I will try to come down the run at a speed of a mile a minute." How many feet per second would that be?



7. The best average speed on the Mountain View bobsled run is 22 yd. per second. At this speed, how many minutes does a bobsled take to come down the run? See ex. 4.

8. Bill and Ned are too young to use the bobsled run but they can coast down a steep hill. The hill is $\frac{1}{6}$ mi. long and the boys together on a sled can coast down it in $\frac{1}{3}$ min. How many feet is that per second? First change $\frac{1}{6}$ mi. to feet and $\frac{1}{3}$ min. to seconds.

9. Bill weighs $83\frac{1}{4}$ lb.; Ned weighs $81\frac{1}{4}$ lb. If they coast together on a sled, find the total weight on the sled?

10. The boys are good skaters. Yesterday Bill skated across the lake and back in 30 min. but Ned took 6 min. longer. How many minutes did Ned take? What part of an hour did each boy take?

11. Last winter during Carnival Week at Mountain View there was a contest for the best animal made out of snow and ice. There were 13 prizes as follows: \$10 for the first price, \$5 for the second prize, \$3 for the third, and 10 prizes of \$1 each. How much money was offered in prizes?

DO YOU KNOW THESE MEASURES?

1. When Bill runs around the running track on the playground 6 times he has gone a mile. How many feet is it around the track?

2. The old stone church on Main Street was built in 1750. About how many centuries old is this church?

3. Jim's father can carry a 3-ton load on his truck. How many boxes each weighing 75 lb. can he put on his truck?

4. Betty drinks 3 glasses of milk every day. If she drinks this amount every day in the year, how many quarts of milk does she drink in a year of 365 days?

5. Ann read that a person should eat 1 egg every day. If Ann does this, about how many dozen eggs will she eat in a year? A case of eggs holds 30 doz. eggs. Is 1 egg a day more or less than 1 case of eggs a year?

6. Pencils are sold to stores by the *gross*. A gross is 12 doz. How many pencils are there in 1 gross? in 6 gross?

7. Mr. Lee says he is 4 score and 5 years old. A score is 20 years. How many years old is Mr. Lee?

Tell what number goes in each space:

8.	2 hr. = .. min.	$\frac{1}{4}$ lb. = .. oz.	$\frac{1}{3}$ yd. = .. in.
9.	4 pk. = .. bu.	8 oz. = .. lb.	3 oz. = .. lb.
10.	1 mo. = .. yr.	1 yr. = .. mo.	1 pt. = .. gal.
11.	$\frac{1}{2}$ min. = .. sec.	$\frac{1}{2}$ mi. = .. ft.	4 in. = .. ft.
12.	$\frac{3}{4}$ hr. = .. min.	4 oz. = .. lb.	$\frac{3}{4}$ bu. = .. pk.
13.	9 in. = .. yd.	6 in. = .. ft.	$\frac{5}{8}$ lb. = .. oz.
14.	$\frac{1}{4}$ gal. = .. pt.	$\frac{1}{2}$ T. = .. lb.	$\frac{1}{4}$ yr. = .. mo.
15.	3 bu. = .. pk.	$\frac{3}{4}$ ft. = .. in.	$\frac{1}{8}$ mi. = .. ft.
16.	$\frac{3}{4}$ lb. = .. oz.	$\frac{3}{4}$ T. = .. lb.	$\frac{3}{4}$ bu. = .. qt.
17.	5 min. = .. hr.	1 da. = .. wk.	3 T. = .. lb.

If you are skillful in computing, you should be able to do all the exercises in each test correctly in the time allowed.

Addition Test

Add. Write the answers on folded paper: Time: 3 min.

1.	3564	2866	4784	2956	7416
	2307	6678	2775	6284	1878
	3552	1334	6315	4502	9391
	3416	1503	1149	2725	2315

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2.	4112	6676	8000	1162	3912
	1126	1683	5043	588	2577
3.	5909	1000	2823	5398	4075
	4488	587	1886	2427	186

Multiplication Test

Copy and multiply: Time: 5 min. after copying.*

4.	268	496	735	954	491	783
	238	705	146	593	602	487

Division Test

Copy and divide: Time: 6 min. after copying.*

5.	44)2772	52)2873	33)1155	65)1369
6.	81)4374	63)1638	75)1800	32)2368

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 308.

1. Mrs. Brown spent $44.10 for food for the family in December. What was the average cost of the food per day?

You divide by 31 since there are 31 days in December. You divide dollars and cents just as you divide any other numbers. Be sure to place the decimal point in the quotient above the decimal point in the dividend. The quotient is $1.42 and there is a remainder of 8¢. Mrs. Brown spent about $1.42 a day for food. Check by multiplying $1.42 by 31 and adding the remainder 8¢.

```
      $ 1.42
31)$ 44.10
     31
     13 1
     12 4
        70
        62
         8
```

2. Joe's father paid $14.28 for 12 fruit trees. What was the average cost per tree?

3. Joe's father also bought 12 berry bushes. He paid $3.00 for them. What was the cost of each berry bush?

Divide and check. First decide whether to divide by the first figure of the divisor or by 1 more than the first figure:

4.	31)$10.85	24)$75.36	46)$164.09	64)$151.04
5.	45)$13.95	37)$94.71	32)$173.76	36)$244.31
6	54)$39.48	26)$61.01	57)$480.03	53)$225.78
7.	43)$22.47	29)$63.61	85)$208.25	68)$257.29
8.	74)$60.68	44)$51.57	49)$158.83	82)$384.63
9.	55)$23.68	28)$65.93	62)$535.79	59)$267.95
10.	32)$20.85	74)$91.79	39)$145.98	87)$108.95
11.	63)$39.83	41)$47.15	77)$566.91	95)$207.19

1. What is the difference between 17,291 and 10,065?

2. How many times is 65 contained in 15,925?

3. Find the product of 386 and 427.

4. Find the average of 486, 371, 425, and 398.

5. What part of a pound is 14 oz.? 8 oz.?

6. How many inches are 6 ft. 7 in.? 3 ft. 2 in.?

7. How do you check an example in addition?

8. How do you check an example in subtraction?

9. How do you check an example in division if it has a remainder?

10. Write a proper fraction; an improper fraction.

11. Write a whole number; a mixed number.

12. In the fraction $\frac{3}{8}$ tell which number is the denominator and which number is the numerator. Also tell the meaning of each number.

13. Add $1\frac{3}{4}$, $2\frac{1}{2}$, $3\frac{1}{8}$, and $2\frac{5}{8}$.

14. What is the remainder when $4\frac{1}{4}$ is subtracted from $6\frac{9}{16}$?

15. Change to mixed numbers: $\frac{16}{5}$, $\frac{21}{9}$, $\frac{30}{8}$, $\frac{40}{6}$.

16. How many nickels can you get for 8 quarters, 6 dimes, and 35 pennies?

17. Show by dividing a circle into eighths that $\frac{3}{4} = \frac{6}{8}$; that $\frac{1}{2} = \frac{2}{4}$; that $\frac{2}{8} = \frac{1}{4}$.

Copy these numbers in columns and add them:

18. \$17.58 + \$29.46 + \$31.50 + \$56.08

19. \$25.25 + \$103.82 + \$64.18 + \$18.75

20. \$84.03 + \$125.00 + \$146.17 + \$39.43

21. \$15.00 + \$378.86 + \$192.81 + \$75.63

22. \$456.62 + \$88.75 + \$206.05 + \$183.84

1. Henry caught 4 fish that weighed 3 lb. all together. What was the average weight per fish? Give the answer in pounds; then change it to ounces.

2. Bill is planning to buy a bicycle in the spring. He can earn \$.75 a week helping Mr. Brown and \$1.15 a week delivering newspapers. How much can he earn in 12 weeks?

3. The bicycle Bill wants costs \$29.98. After working 12 weeks, how much more money will Bill need in order to buy the bicycle? See ex. 2.

4. Elizabeth bought 3 grapefruit for a quarter. What was the cost of 1 grapefruit?

5. Mr. Lee pays Jim 25¢ an hour for work Jim does for him. He pays Jim at the end of the week. Jim worked $1\frac{1}{2}$ hr., $3\frac{1}{4}$ hr., and $1\frac{1}{4}$ hr. last week. How much money did he earn last week?

6. With the wind behind him Joe skated across the lake in $\frac{1}{4}$ hr. When he came back against the wind it took $\frac{1}{2}$ hr. How long did Joe take to skate across the lake and back?

7. Miss White's class wants a new United States flag to hang up in the classroom. They can buy a good one for \$5.28. If the 33 children divide the cost equally, how much will each one pay?

8. Ann needs a gypsy costume for the school fair. She can order one by mail for 89¢. If she makes a costume she would have to pay 36¢ for flowered material, 23¢ for red cloth, and 23¢ for purple cloth. How much would Ann save by buying the material and making the costume? Is this saving enough to pay for the time it would take to make the costume?

Add and check the work:

1.	24	64	41	26	43	52	73
	55	55	73	78	68	60	36
	87	76	69	47	14	37	52
	69	97	98	94	56	88	27
	52	48	24	35	83	79	64
	13	21	42	68	75	43	28

2.	912	287	558	540	239	518	273
	538	640	872	438	482	397	445
	693	356	691	992	698	874	866
	155	991	103	767	973	985	134
	349	408	176	259	114	408	377

Multiply and check the work:

3.	84	29	359	104	619	3402
	26	75	81	269	597	29
4.	73	37	384	617	570	1648
	65	94	73	247	236	85
5.	38	96	465	249	354	2708
	68	46	38	564	753	79
6.	96	72	158	580	389	7126
	39	83	94	745	812	62

Subtract and check the work:

7.	7181	6405	5820	47229	63301
	3639	1729	2852	41285	45875
8.	7043	9651	3907	52818	37016
	6858	6854	3239	8432	16618
9.	5235	9695	8478	17213	28207
	3367	1778	5553	15465	6653

REVIEW OF DIVISION

Divide. Write the remainder as a fraction in the quotient:

1. $5\overline{)18}$ $4\overline{)17}$ $9\overline{)94}$ $8\overline{)239}$ $2\overline{)175}$ $6\overline{)145}$

2. $3\overline{)10}$ $8\overline{)35}$ $4\overline{)65}$ $7\overline{)473}$ $9\overline{)488}$ $3\overline{)254}$

3. $6\overline{)13}$ $7\overline{)25}$ $2\overline{)83}$ $5\overline{)364}$ $4\overline{)295}$ $8\overline{)585}$

Estimate the quotient figure in these exercises:

4. $20\overline{)53}$ $40\overline{)93}$ $31\overline{)62}$ $62\overline{)372}$ $84\overline{)420}$ $73\overline{)584}$

5. $29\overline{)80}$ $46\overline{)83}$ $37\overline{)70}$ $68\overline{)351}$ $59\overline{)491}$ $88\overline{)817}$

Divide each number by 30; by 23; by 35; by 29. Write R before remainders, if any:

6. 490 718 3926 7415 1955

7. 169 355 1543 6348 2884

Divide. Check the work by multiplying:

8. $21\overline{)819}$ $34\overline{)1496}$ $52\overline{)3236}$ $66\overline{)4465}$ $19\overline{)13026}$

9. $37\overline{)901}$ $57\overline{)1580}$ $83\overline{)2685}$ $43\overline{)2666}$ $76\overline{)21143}$

10. $27\overline{)993}$ $69\overline{)3875}$ $73\overline{)6862}$ $62\overline{)1807}$ $51\overline{)41973}$

11. $26\overline{)614}$ $19\overline{)1205}$ $31\overline{)2604}$ $45\overline{)1620}$ $82\overline{)56662}$

12. $42\overline{)924}$ $75\overline{)2025}$ $39\overline{)2433}$ $22\overline{)1408}$ $55\overline{)42680}$

13. $31\overline{)744}$ $47\overline{)3544}$ $49\overline{)3113}$ $58\overline{)2634}$ $78\overline{)35829}$

14. $21\overline{)966}$ $32\overline{)1728}$ $65\overline{)1625}$ $41\overline{)3526}$ $53\overline{)44785}$

1. Reduce to lowest terms those fractions which are not already in their lowest terms: $\frac{5}{6}$, $\frac{8}{16}$, $\frac{3}{4}$, $\frac{8}{10}$, $\frac{7}{12}$, $\frac{3}{16}$, $\frac{10}{16}$, $\frac{4}{6}$, $\frac{12}{16}$.

2. Reduce each fraction to a whole number or a mixed number: $\frac{18}{4}$, $\frac{22}{6}$, $\frac{17}{8}$, $\frac{30}{10}$, $\frac{22}{16}$, $\frac{6}{6}$, $\frac{40}{12}$, $\frac{16}{12}$.

Tell what number should be put in place of the star so that the two fractions will be equal:

3.	$\frac{1}{4} = \frac{*}{12}$	$\frac{3}{4} = \frac{*}{16}$	$\frac{2}{3} = \frac{*}{12}$	$\frac{3}{8} = \frac{*}{16}$
4.	$\frac{1}{3} = \frac{*}{6}$	$\frac{1}{5} = \frac{*}{10}$	$\frac{5}{6} = \frac{*}{12}$	$\frac{1}{2} = \frac{*}{10}$
5.	$\frac{5}{8} = \frac{*}{16}$	$\frac{1}{2} = \frac{*}{12}$	$\frac{7}{8} = \frac{*}{16}$	$\frac{3}{4} = \frac{*}{8}$

Tell what number should be put in each space:

6. To reduce $\frac{12}{16}$ to $\frac{3}{4}$ divide both 12 and 16 by . . .

7. To change $\frac{2}{3}$ to $\frac{4}{6}$ multiply both 2 and 3 by . . .

8. Does the fraction $\frac{2}{3}$ equal the fraction $\frac{8}{12}$? Why?

Add. Check the work by going over it:

9.	$\frac{1}{10}$	$3\frac{3}{8}$	$2\frac{9}{16}$	$5\frac{2}{3}$	$2\frac{2}{3}$	$3\frac{7}{10}$	$2\frac{3}{4}$
	$\frac{7}{10}$	$2\frac{1}{2}$	$3\frac{1}{8}$	$1\frac{1}{12}$	$1\frac{5}{6}$	$2\frac{1}{2}$	$1\frac{5}{12}$
10.	$\frac{1}{2}$	$1\frac{5}{6}$	$1\frac{3}{4}$	$3\frac{1}{12}$	$4\frac{1}{2}$	$2\frac{1}{5}$	$2\frac{3}{4}$
	$\frac{1}{4}$	$2\frac{1}{3}$	$\frac{2}{3}$	$2\frac{5}{12}$	$3\frac{1}{8}$	$3\frac{7}{10}$	$4\frac{1}{8}$
	$\frac{5}{8}$	$\frac{1}{2}$	$2\frac{7}{12}$	$1\frac{7}{12}$	$2\frac{1}{4}$	$4\frac{1}{10}$	$3\frac{5}{16}$

Subtract. Check the work by going over it:

11.	$\frac{1}{2}$	$2\frac{3}{4}$	$5\frac{7}{8}$	$2\frac{15}{16}$	$3\frac{3}{4}$	$2\frac{3}{5}$	$1\frac{7}{8}$
	$\frac{3}{16}$	$1\frac{1}{4}$	$2\frac{1}{2}$	$1\frac{3}{8}$	$\frac{1}{12}$	$2\frac{1}{10}$	$\frac{7}{16}$
12.	$\frac{1}{2}$	$2\frac{7}{12}$	$2\frac{13}{16}$	$4\frac{11}{12}$	$3\frac{1}{2}$	$6\frac{2}{3}$	$2\frac{9}{10}$
	$\frac{1}{6}$	$\frac{1}{2}$	$1\frac{3}{8}$	$3\frac{1}{2}$	$1\frac{1}{10}$	$4\frac{5}{12}$	$\frac{3}{5}$

1. How many quarts make 1 peck?

2. How many quarts make 1 bushel?

3. Bill's father feeds his chickens 4 qt. of grain a day. At that rate, how many days will a bushel of grain last?

4. What part of a bushel is 2 pk.? 3 pk.?

5. Tell which of these fractions are proper fractions and which are improper fractions:

$\frac{4}{3}$ $\frac{12}{6}$ $\frac{7}{8}$ $\frac{15}{3}$ $\frac{10}{12}$ $\frac{5}{4}$ $\frac{6}{6}$ $\frac{9}{10}$

6. Write the fraction whose numerator is 6 and whose denominator is 9. Reduce this fraction to lowest terms.

7. Write a proper fraction using the numbers 8 and 3.

8. Divide a circle into parts to show that $\frac{6}{8} = \frac{3}{4}$.

9. By what number do you multiply both numerator and denominator of $\frac{2}{3}$ to change it to $\frac{8}{12}$? to change $\frac{3}{8}$ to $\frac{6}{16}$?

10. By what number do you divide both numerator and denominator of $\frac{10}{12}$ to change it to $\frac{5}{6}$? to change $\frac{12}{16}$ to $\frac{3}{4}$?

11. Tell 2 different ways to check the example 428×356.

Add and check the work:

12.

$\frac{5}{6}$	$2\frac{1}{16}$	$3\frac{1}{4}$	$3\frac{1}{4}$	$1\frac{1}{2}$	$14\frac{2}{3}$	$12\frac{1}{5}$
$\frac{1}{6}$	$3\frac{5}{16}$	$5\frac{13}{16}$	$2\frac{1}{8}$	$3\frac{1}{8}$	$11\frac{7}{12}$	$9\frac{4}{10}$

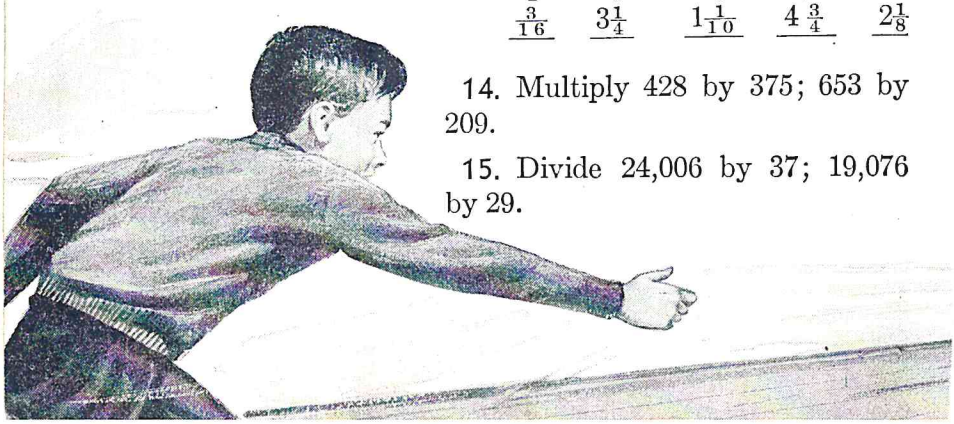
Subtract and check the work:

13.

$\frac{1}{4}$	$4\frac{7}{8}$	$3\frac{3}{5}$	$5\frac{11}{12}$	$2\frac{7}{8}$
$\frac{3}{16}$	$3\frac{1}{4}$	$1\frac{1}{10}$	$4\frac{3}{4}$	$2\frac{1}{8}$

14. Multiply 428 by 375; 653 by 209.

15. Divide 24,006 by 37; 19,076 by 29.



1. Eight girls bought these things for their lunch: a loaf of bread for 16¢, cheese spread for 25¢, cookies for 30¢, apples for 27¢, and milk for 30¢. What was each girl's share of the cost?

2. The bill for 35 English books for our class was $40.25. What was the cost of each book?

3. Jack's father bought 12 gal. of gasoline at $.23 a gallon and a quart of oil for $.30. How much change did he get from a 5-dollar bill?

4. Betty's dress requires $2\frac{1}{2}$ yd. of material and her mother's requires $3\frac{3}{4}$ yd. If both dresses are made from the same material, how many yards are needed all together?

5. The train trip to Milton took $4\frac{1}{2}$ hr. The trip home took $5\frac{3}{4}$ hr. How much longer was the trip coming home?

6. Bill's father sold these amounts of gasoline in 4 weeks: 440 gal., 358 gal., 527 gal., and 517 gal. Find the average amount of gasoline he sold per week.

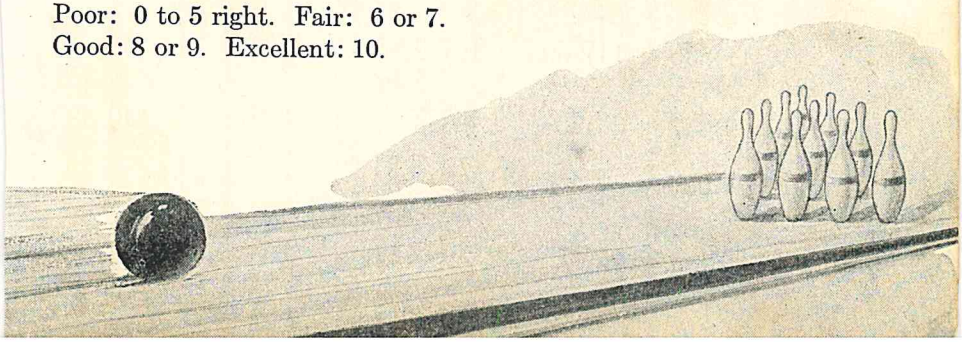
7. Mr. Brown wants to make a trip of 1440 mi. in his car. He averages about 18 mi. on a gallon of gasoline. About how many gallons will he use on this trip?

8. At an average speed of 32 mi. an hour, how many hours of driving should Mr. Brown take for a trip of 1440 mi.?

9. Helen paid $1.45 for 3 cans of plums and a cake. The cake cost $.40. Find the cost of 1 can of plums.

10. Alice needs $\frac{3}{4}$ yd. of cretonne for a cushion. How much will it cost at $.80 a yard?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



DO YOU NEED HELP?

If you miss more than one example in any row, turn to the Practice Pages for that row:

					PRACTICE PAGES
Add and check the work:					
1.	4247 2674 1879 2346	2613 1007 3796 4028	3096 1742 3477 1827	1248 3000 2587 3179	27
Subtract and check the work:					
2.	3045 1549	7009 2484	4823 2257	6000 4287	14
Multiply and check:					
3.	26 × 1932	38 × 4657	54 × 2816		24
4.	467 × 518	179 × 479	385 × 832		51
5.	206 × 947	530 × 614	109 × 358		96
Divide and check. Write R before remainders:					
6.	6)750	9)2385	7)5105	8)4655	44
7.	31)775	21)1323	41)1066	21)1554	55, 57
8.	35)840	43)1935	52)3229	34)1394	57, 61
9.	24)600	32)1856	35)2345	24)8328	98, 99
10.	24)191	35)2700	23)1806	25)1650	104
11.	11)836	11)2695	12)4248	12)3228	108
12.	49)647	36)2088	28)1390	37)8710	140, 141

Diagnostic test.

If you miss more than one example in any row, turn to the Practice Pages for that row.

						PRACTICE PAGES
Reduce each fraction to lowest terms:						
1. $\frac{14}{16}$	$\frac{10}{20}$	$\frac{4}{8}$	$\frac{6}{10}$	$\frac{9}{12}$	$\frac{4}{6}$	81
Reduce to whole numbers or to mixed numbers:						
2. $\frac{19}{4}$	$\frac{40}{8}$	$\frac{16}{6}$	$\frac{17}{3}$	$\frac{20}{12}$	$\frac{48}{16}$	91
Add and check:						
3. $2\frac{1}{5}$	$4\frac{5}{8}$	$2\frac{1}{10}$	$2\frac{1}{8}$	$2\frac{1}{16}$		79, 83
$3\frac{3}{5}$	$2\frac{1}{8}$	$1\frac{1}{10}$	$3\frac{4}{8}$	$\frac{7}{16}$		
4. $\frac{2}{3}$	$4\frac{9}{10}$	$3\frac{7}{12}$	$4\frac{5}{6}$	$3\frac{9}{16}$		93
$\frac{2}{3}$	$1\frac{1}{10}$	$2\frac{6}{12}$	$3\frac{1}{6}$	$4\frac{8}{16}$		
5. $2\frac{7}{12}$	$3\frac{3}{8}$	$1\frac{9}{10}$	$6\frac{5}{16}$	$1\frac{11}{12}$		94
$3\frac{7}{12}$	$\frac{7}{8}$	$2\frac{3}{10}$	$3\frac{7}{16}$	$\frac{5}{12}$		
6. $3\frac{1}{4}$	$6\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{2}{3}$	$3\frac{1}{16}$		124
$2\frac{1}{12}$	$2\frac{2}{3}$	$3\frac{1}{4}$	$3\frac{1}{2}$	$2\frac{1}{8}$		
$1\frac{1}{4}$	$3\frac{1}{12}$	$1\frac{7}{8}$	$2\frac{1}{6}$	$1\frac{1}{2}$		
Subtract and check:						
7. $2\frac{5}{6}$	$2\frac{1}{3}$	$4\frac{7}{8}$	$3\frac{9}{10}$	$7\frac{5}{16}$		84, 85
$2\frac{1}{6}$	$\frac{1}{3}$	$1\frac{1}{8}$	$2\frac{6}{10}$	$5\frac{3}{16}$		
8. $4\frac{1}{2}$	$3\frac{1}{6}$	$2\frac{5}{6}$	$5\frac{11}{16}$	$4\frac{3}{5}$		128
$2\frac{5}{16}$	$2\frac{1}{12}$	$\frac{1}{2}$	$3\frac{1}{2}$	$3\frac{1}{10}$		
9. $2\frac{7}{10}$	$4\frac{13}{16}$	$3\frac{3}{4}$	$5\frac{11}{12}$	$6\frac{7}{8}$		129
$2\frac{3}{5}$	$\frac{1}{2}$	$2\frac{9}{16}$	$3\frac{2}{3}$	$3\frac{5}{16}$		

Diagnostic test.

CHAPTER FIVE

More Work with Fractions

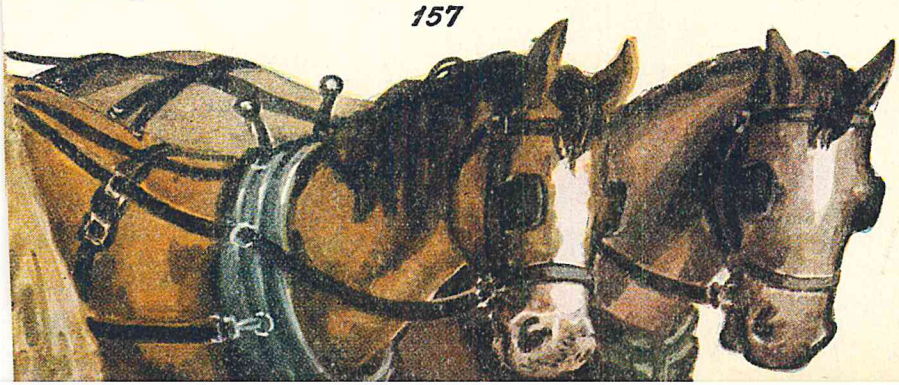
MAPLE SUGAR

1. The season for making maple sugar begins near the end of the winter when the sugar maple trees are tapped to obtain their sap. When the sap is boiled over a hot fire it becomes maple sirup; if it is boiled still longer, the maple sirup becomes maple sugar. Each season the average sugar maple tree gives 10 gal. of sap which makes 1 qt. of maple sirup. How many sugar maple trees does it take to make 1 gal. of maple sirup?

2. Mr. Ford has 1680 maple trees in his maple orchard. How many gallons of maple sirup should he get in a season from these trees? See ex. 1.

3. Mr. Ford boiled 120 gal. of sirup until it became maple sugar. Each gallon of sirup makes 8 lb. of maple sugar. How many pounds of maple sugar did he get?

4. Mr. Ford sold 188 gal. of maple sirup at $3.25 a gallon, 90 gal. at $2.85 a gallon, and 935 lb. of maple sugar at 45¢ a pound. How much in all did he receive for the sirup and the sugar?



1. It takes 4 trees to produce 1 gal. of maple sirup which will make 8 lb. of maple sugar. How many pounds of maple sugar will 1 tree produce?

2. One year a hurricane destroyed 240 of Mr. Ford's maple trees. Find the value of the sugar those trees would have produced each year if maple sugar is worth 45¢ a pound and if each tree would produce 2 lb. of sugar.

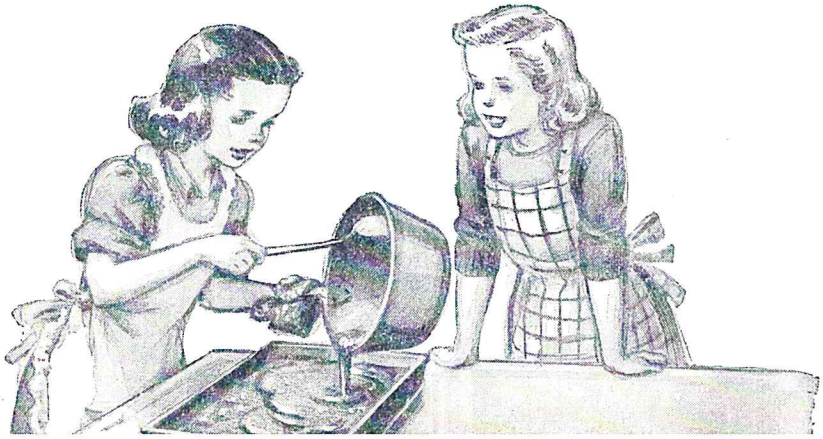
3. In a recent year Vermont, New Hampshire, Maine, and Massachusetts together produced 685,400 lb. of maple sugar and 1,315,600 gal. of maple sirup. If all the sirup had been boiled down to sugar, what would have been the total number of pounds of sugar produced in these four states? Each gallon of maple sirup makes 8 lb. of maple sugar.

4. That same year the United States would have produced 22,792,000 lb. of sugar if all the sirup had been boiled down to sugar. It is said that about half the maple sirup and sugar produced in this country comes from the 4 states mentioned in ex. 3. See if this statement is true by comparing the answer to ex. 3 with 22,792,000 lb.

5. Here is a recipe for making maple sugar fudge:

1 cup maple sugar 2 cups white sugar $\frac{2}{3}$ cup sweet milk
$\frac{3}{4}$ cup walnut meats 1 tablespoon butter

Mary wants to make twice as much fudge as the recipe will make. How much of each thing should she use?



1. Joe often counts the cars that pass his house. Yesterday he counted 245 cars in 27 minutes. Joe wondered about how many cars that was per minute. Do you know?

Since the divisor is 27, divide by 3 to estimate the quotient figure. Think "24 ÷ 3 = 8." Write 8 in the quotient as shown in *A*. Multiply 27 by 8, which gives 216, and subtract it from 245. The remainder is 29. Since 29 is *larger* than 27, you see that 27 will go into 29 one more time. This means that the quotient figure 8 is too small.

A

```
      8
27)245
   216
    29
```

Try 9 as a quotient figure as shown in *B*. This gives a remainder of 2 which is *less* than 27, so 9 is the right quotient. *The remainder must always be smaller than the divisor.*

B

```
      9
27)245
   243
     2
```

When the remainder is equal to or larger than the divisor, make the quotient figure 1 larger.

Divide and check. To get the quotient figures, divide by 1 more than the first figure of the divisor:

2.	29)179	37)225	38)342	19)135	69)483
3.	36)289	19)171	47)334	28)169	26)133
4.	18)126	56)453	66)533	59)472	57)513
5.	28)259	39)235	76)456	67)471	29)235
6.	87)526	69)347	18)167	86)774	76)689
7.	26)182	48)384	57)403	79)475	68)476

Correcting quotient figures.

TOWELS FOR SALE

1. The girls in the sewing class are to have a sale of kitchen towels. Each one of the 24 girls will make 2 towels. It takes 66 in. of toweling to make 2 towels. Miss Lane asked Jane to find the number of yards of toweling the class should buy. Jane multiplied 66 in. by 24 and got 1584 in. Then she changed 1584 in. to yards by dividing by 36 in. How many yards should the class buy?

Jane thought, "Since the divisor 36 ends in 6, I will divide by 4. There are three 4's in 15, so 3 is the first quotient figure." But when Jane used 3 for the quotient she got a remainder of 50. Then she knew that 3 was too small because 50 is larger than the divisor 36. So she changed the quotient to 4 and went on with the work. Why is 4 right? Tell how to finish the work. The class must buy 44 yd. of toweling.

```
      44
36)1584
   144
    144
    144
```

2. The class bought 44 yd. of toweling and paid $.30 a yard for it. If this amount of toweling made 48 towels, find the cost of each towel.

3. How many yards of toweling will the class need if there are 18 girls and if each girl uses 66 in. of toweling?

4. If the girls bought 33 yd. of toweling and paid $.30 a yard for it, what was the cost of each one of the 36 towels they made?

5. How many yards of toweling will 27 girls need if each girl makes 2 long towels and uses 80 in. of toweling for the two towels?

6. Find the cost of 60 yd. of toweling at $.27 a yard. What was the cost of each one of the 54 towels?

Divide. Check the work by multiplying:

7.	28)2352	19)1482	68)5576	59)2124	76)39381
8.	27)1674	46)1472	29)2697	67)4891	26)13832
9.	58)3596	36)1944	37)1924	26)2522	56)41616
10.	29)2088	38)1976	47)4418	37)1189	27)17712
11.	76)4791	36)2340	27)1166	38)1596	46)19603
12.	19)5187	26)2184	57)4104	36)1159	28)16688
13.	38)2394	56)1792	29)1799	28)2296	66)34129
14.	79)5925	26)1950	39)3198	37)2368	48)17376
15.	26)1352	28)1456	36)2736	47)3858	26)12636
16.	36)3420	48)3984	26)1459	39)3588	86)62283

1. Study the two examples below. Each example is worked both the long way and the short way:

A. Long Way	*B.* Short Way	*C.* Long Way	*D.* Short Way
270	270	390	390
64)17280	64)17280	27)10536	27)10536
128	128	81	81
448	448	243	243
448	448	243	243
0	0	6	6
0		0	
		6	

In *A* you find the first two figures of the quotient in the usual way. When you subtract 448 from 448, there is no remainder but the work is not finished since there is a 0 in the dividend still to be brought down. Bring down the 0. Then divide 0 by 64, which gives 0; write this 0 in the quotient. Complete the work by taking these final steps: (*a*) Multiply 64 by 0, which gives 0. (*b*) Subtract 0 from 0, which leaves no remainder. The work is finished because all the figures have been brought down.

In *B* the first part of the work is the same as in *A* but the final steps (*a*) and (*b*), mentioned above, are omitted.

2. How does the work in *D* differ from that in *C*?

Divide and check:

3. 26)9620	81)43593	67)32832	33)22453
4. 18)4693	35)16121	54)17172	88)75685
5. 54)9727	27)15120	95)44691	57)25650
6. 37)9271	59)30727	43)16347	41)25709
7. 19)8170	75)27023	69)51084	55)30800

1. The work below shows the long way and the short way to divide when there is a zero in the middle of the quotient.

A. Long Way	*B.* Short Way	*C.* Long Way	*D.* Short Way
802	802	306	306
48)38497	48)38497	87)26641	87)26641
384	384	261	261
9	97	54	541
0	96	0	522
97	1	541	19
96		522	
1		19	

In *A*, when you start to get the second quotient figure, you see that 9 does not contain 48, so you write 0 in the quotient. Your next steps are as follows: (*a*) Multiply 48 by 0, which gives 0. (*b*) Write 0 under 9 and subtract, which leaves 9. (*c*) Bring down the 7, which gives 97 as a new partial dividend. Finish the work as usual.

In *B* you omit steps (*a*) and (*b*) and bring down 7 at once.

2. How does the work in *D* differ from that in *C*?

Divide and check:

3. 34)23915	86)60630	19)13338	38)26037
4. 59)29680	43)13287	65)19152	69)14375
5. 26)15704	94)28695	57)45957	18)14454
6. 82)17056	75)52889	27)21843	45)27146
7. 66)26479	89)36452	36)32549	58)40855
8. 78)31687	56)50587	62)43475	96)57893

Add 7 mentally to each number; add 8; add 9; add 6:

1.	25	83	69	42	91	37	78	54
2.	79	55	38	70	43	84	26	92
3.	44	68	93	85	56	39	72	27

Copy, add, and check:

4. \$216.89 + \$38.47 + \$524.96 + \$82.65
5. \$47.45 + \$296.86 + \$69.69 + \$110.73
6. \$145.48 + \$176.95 + \$98.57 + \$37.02
7. \$116.97 + \$38.59 + \$73.62 + \$245.38

Add and check:

8.	356	654	870	378	312	338
	449	397	548	535	857	957
	778	228	482	681	586	746
	894	425	937	859	969	672
	382	731	113	213	194	467
	137	566	155	466	403	224

Subtract and check:

9.	50284	53408	63192	31462	47217
	33958	32662	53673	12587	37539
10.	82369	40000	73756	66485	81374
	33584	21483	47359	47488	21559
11.	95031	62193	62291	71680	76609
	46085	39758	37529	18347	25982

12. Find the difference between \$832.64 and \$295.09.
13. Subtract \$385.16 from \$400.00.

1. John and his mother went to the city to do some shopping. They left at 8:40 A.M. and got back home at 6:15 P.M. How long were they gone?

2. John's mother bought a raincoat for John for $4.28. The coat had been selling for $5.95. How much less than the regular price did the raincoat cost?

3. John had $1.00 to spend for ties. He selected one that cost $.65 and another that cost $.50. How much did he need to borrow from his mother in order to have enough to buy the ties?

4. John's shoes cost $3.98. His mother paid for them with a five-dollar bill. How much change did she get?

5. At noon John and his mother had lunch. John's lunch cost $.45 and his mother's lunch cost $.50. How much did both lunches cost?

6. In the afternoon John and his mother went to the movies. Tickets cost $.55 each. What did the two movie tickets cost?

7. On the way to the station John stopped to look at bicycles. He saw one that he would like to buy for $24.95. He has already saved $19.10. If he can save $.65 a week, how many weeks will it take him to save the rest of the money he needs for the bicycle?

1. When the divisors 13 to 19 are used it is often necessary to correct the quotient figures several times before the right figure is obtained. You can avoid some of these corrections by following these suggestions:

(1) When you divide by 13, 14, and 15, do not follow the rule on page 57 since it does not give satisfactory results. For these three divisors it is better to estimate the quotient figure as closely as you can and then to multiply and subtract to see if your estimate is right. Also remember that *the remainder will be less than the divisor if the quotient figure is right.*

(2) When you divide by 16, 17, 18, or 19, estimate each quotient figure by dividing by 2. See the rule on page 139. Also see the footnote at the bottom of this page.

2. In dividing 513 by 13, suppose you try 5 as the first quotient figure, as shown in *A*. Why is 5 too large?

```
A.      5          B.      4          C.      3
     13)513             13)513             13)513
        65                 52                 39
                                              12
```

Then try 4, as in *B*; why is 4 wrong? Then try 3, as in *C*; why is 3 right? Finish the work in *C*.

3. In dividing 156 by 17, each quotient figure is estimated by dividing by 2 as suggested above in ex. 1. Dividing 15 by 2, you get 7 for the quotient as shown below in *A*. Why is 7 wrong? Why is 8 wrong as shown in *B*? Why is 9 right as shown in *C*? Finish *C*.

```
A.      7          B.      8          C.      9
     17)156             17)156             17)156
        119                136                153
         37                 20                  3
```

To the Teacher: For the divisors 16 and 17, the quotient figure obtained by dividing by 2 may need to be corrected once, or at most twice, to get the right quotient figure. For the divisors 18 and 19, not over one correction is necessary.

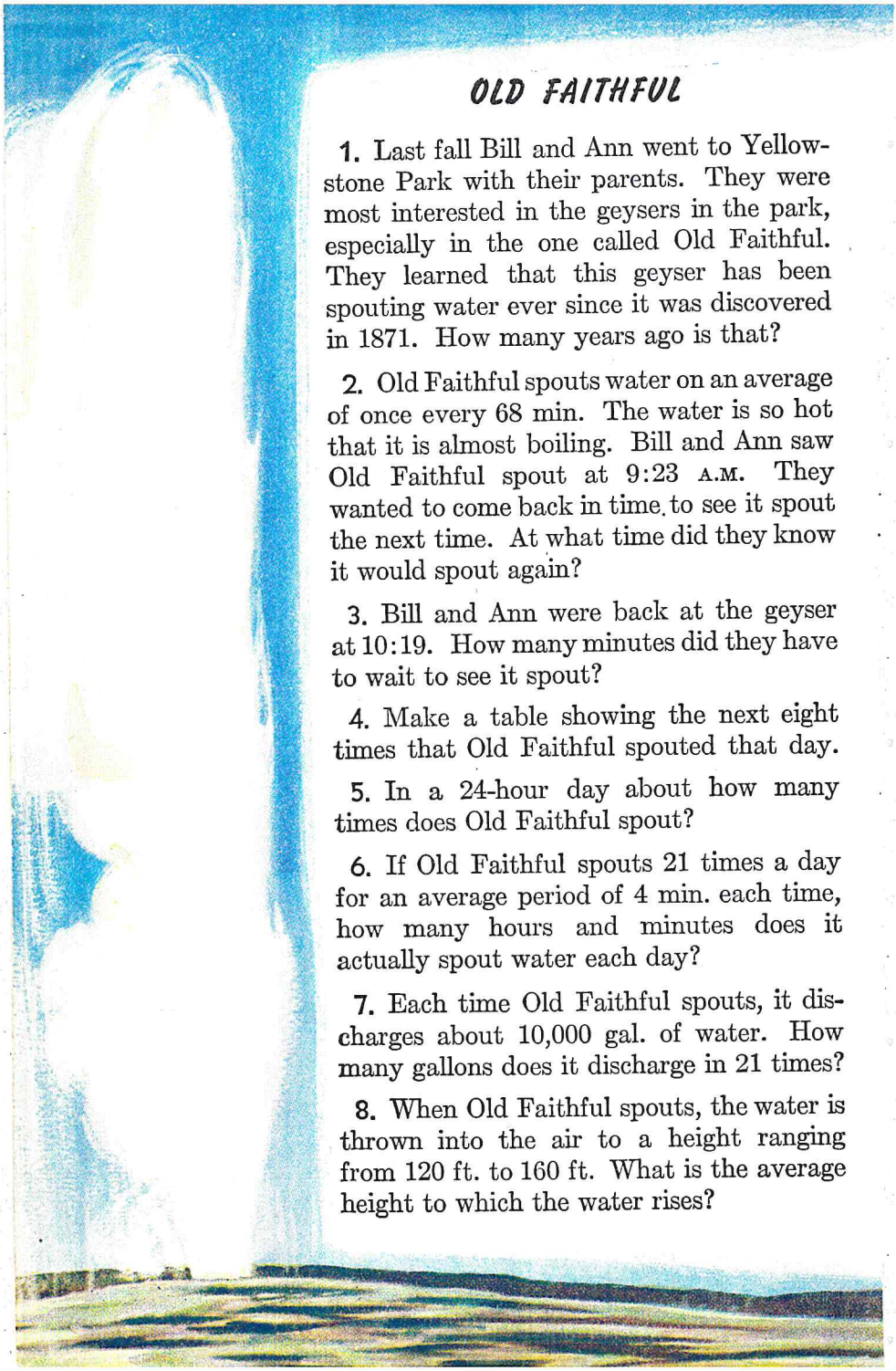
1. For a day's trip in his car Jim's father paid a total of \$3.23 for gasoline at \$.19 a gallon. How many gallons did he buy for the trip?

2. Jim's father told him the speedometer showed 6786 mi. when he left home and 7058 mi. when he returned. He asked Jim to find the average number of miles he drove on a gallon of gasoline. Can you find the average? See ex. 1.

3. Jim's father must make a trip of 432 mi. next week. If he drives an average of 16 mi. on a gallon of gasoline, how many gallons in all will he need for the trip?

Divide. Check the work by multiplying:

4.	15)720	17)1139	13)1038	19)1691	16)1024
5.	19)674	16)1248	17)1520	15)1477	14)1225
6.	13)312	18)5850	19)1501	17)1300	16)1077
7.	19)893	16)1552	14)1064	15)1281	18)1165
8.	14)784	19)1805	17)1640	16)1168	13)1099
9.	15)519	13)1157	18)1751	19)1875	17)7854
10.	17)493	18)1234	19)1034	15)1440	14)1330
11.	19)513	15)1140	17)1445	13)1105	18)1062
12.	14)630	16)1344	13)1290	18)4914	14)1163
13.	18)792	15)1275	14)1372	16)1477	19)6232



OLD FAITHFUL

1. Last fall Bill and Ann went to Yellowstone Park with their parents. They were most interested in the geysers in the park, especially in the one called Old Faithful. They learned that this geyser has been spouting water ever since it was discovered in 1871. How many years ago is that?

2. Old Faithful spouts water on an average of once every 68 min. The water is so hot that it is almost boiling. Bill and Ann saw Old Faithful spout at 9:23 A.M. They wanted to come back in time to see it spout the next time. At what time did they know it would spout again?

3. Bill and Ann were back at the geyser at 10:19. How many minutes did they have to wait to see it spout?

4. Make a table showing the next eight times that Old Faithful spouted that day.

5. In a 24-hour day about how many times does Old Faithful spout?

6. If Old Faithful spouts 21 times a day for an average period of 4 min. each time, how many hours and minutes does it actually spout water each day?

7. Each time Old Faithful spouts, it discharges about 10,000 gal. of water. How many gallons does it discharge in 21 times?

8. When Old Faithful spouts, the water is thrown into the air to a height ranging from 120 ft. to 160 ft. What is the average height to which the water rises?

Add and check the work:

1. 95	21	44	97	41	40	27
84	39	69	23	58	71	38
56	94	83	65	92	76	74
68	46	78	82	23	83	25
97	89	46	36	69	67	63
31	55	37	74	65	24	17
23	12	51	49	27	38	56

2. 58	42	81	27	50	13	56
81	76	48	34	93	35	98
36	25	32	19	38	67	82
69	54	16	96	27	72	41
93	69	95	58	72	29	13
43	91	57	65	59	44	89
24	17	59	42	46	68	27

Give the answers orally:

3.	$9 \times 8 + 7$	$7 \times 5 + 6$	$9 \times 6 + 8$	$7 \times 6 + 5$
4.	$7 \times 9 + 5$	$6 \times 8 + 5$	$5 \times 7 + 4$	$3 \times 9 + 2$
5.	$8 \times 7 + 7$	$4 \times 7 + 3$	$6 \times 3 + 5$	$8 \times 4 + 7$
6.	$4 \times 9 + 2$	$7 \times 7 + 6$	$8 \times 8 + 7$	$9 \times 9 + 8$

Multiply and check the work:

7.	834	529	476	607	1920	7386
	627	438	195	370	59	84
8.	518	483	295	768	5871	2895
	591	389	607	260	65	28
9.	496	916	703	519	6293	8154
	763	204	493	320	85	49
10.	287	746	647	894	2085	3972
	371	854	239	450	37	96

The boys and girls in Mary's class were asked to tell some places where they had seen Roman numbers used.

1. Arthur said he saw XVI on the last book in a set of books in the library. What number is that?

2. Tom said he saw XXVII at the beginning of the last chapter in a big book. Can you read that number?

3. Mary saw this number on the outside of the school building: MCMXXXV; it tells the year in which the school was built. Can you read the number?

4. No one in Mary's class could read the Roman number in ex. 3 so Miss White said she would tell them how to read such numbers. She said that all Roman numbers can be written with these seven letters:

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

5. Miss White gave them these numbers to study:

XXX = 30	LXX = 70	CC = 200	DC = 600
XL = 40	LXXX = 80	CCC = 300	DCC = 700
L = 50	XC = 90	CD = 400	DCCC = 800
LX = 60	C = 100	D = 500	CM = 900

6. Then Miss White gave them these rules:

(1) If the letters are alike, or if the first letter has a greater value than the second, add them.

XXX = 30; CC = 200; LX = 60; DCC = 700.

(2) If the first letter has a smaller value than the second, subtract the first from the second.

IV = 4; XL = 40; XC = 90; CM = 900.

7. Study these numbers carefully:

XLII = 42	CCCLV = 355	MDCII = 1602
LXXI = 71	DCLXV = 665	MCMXI = 1911
XCVI = 96	CDXCI = 491	MCDLX = 1460

8. Now look at Mary's number, MCMXXXV. (See ex. 3.) Tell what M stands for; then tell what CM stands for; then XXXV. Can you read the number now?

900 is sometimes written DCCCC; 4 is sometimes written IIII.

Write these Roman numbers using our numerals:

9.	LXXII	MCMX	CIX	MDCCCCV
10.	XCVII	LVIII	DCV	MCDXLII
11.	XLIII	CLIX	MXC	MCMXXIX
12.	LXXXI	LXVII	DXI	MCMXLIV

Write these numbers using Roman numerals:

13.	38	85	52	475	1775	1825
14.	96	64	47	212	1853	1945

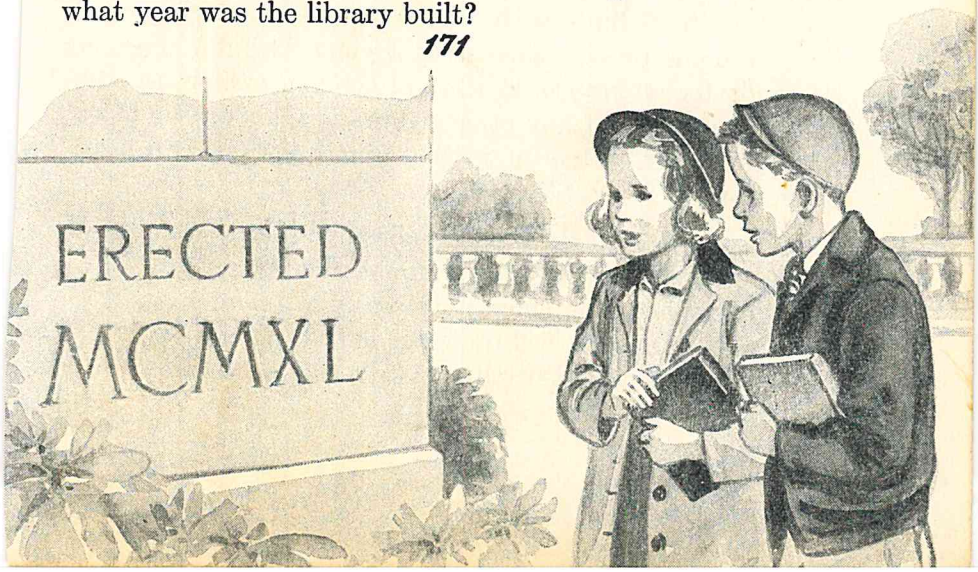
Write the following in Roman numerals:

15. The year you were born; this year and next year.

16. The year Washington was born — 1732.

17. The year the old church was built is marked on a stone "Built MDCCXCV." When was the church built?

18. The new library in Centerville has this Roman number cut on the cornerstone of the building: MCMXL. In what year was the library built?



1. When we write numbers we use the ten figures 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. These figures are called *Arabic* numerals or *Hindu-Arabic* numerals. These numerals were first used in India over 2000 years ago and were brought to Europe by the Arabs. The important thing about these numerals, as we use them today, is that they contain the figure 0, which we call *zero*. You will learn below why the zero is so important in our system of writing numbers.

2. The Roman system of writing numbers uses the seven letters I, V, X, L, C, D, M, but there is no letter in this system that stands for zero.

3. You will find it interesting to study our way of writing numbers to see why the zero is important. The number 3 means 3 *ones* or 3 *units*. If you write a 0 after 3, you get 30 and the 3 now means 3 *tens;* if you write a 0 after 30, you get 300 and the 3 now means 3 *hundreds;* if you write a 0 after 300, you get 3000, and the 3 now means 3 *thousands*.

3 means 3 ones
30 means 3 tens
300 means 3 hundreds
3000 means 3 thousands

4. In ex. 3 you see that each time you write a 0 at the right of the number, you push the 3 one more place to the left. You may think of the *zero* as a *pusher* which pushes the 3 into the proper place so that you will know whether it stands for 3 *ones*, or 3 *tens*, or 3 *hundreds*. Since the value of the 3, or of any other figure, depends on the place it occupies, our system of writing numbers is said to have *place value*.

5. The numbers at the right also illustrate the idea of place value. In each of these numbers the figure 5 has a different value since it occupies a different place in the number. Tell the value of the 5 in each of these numbers. Also tell the value of the 3 in each of these numbers.

345
356
513
5239

6. In the number 307, the 0 shows that there are *no* tens. By writing the 0, you fill the tens place with the figure 0 even though it has no value. Since the 0 *fills* the tens place, it pushes the 3 of 307 over to the hundreds place, and keeps the 7 in the ones place. In cases like this, the zero is called a *place holder*.

7. Now study the Roman numbers at the right. The letter V means 5 ones, or 5. If you push the V one place to the left by writing I after it, you get VI but the V still stands for 5; notice that the V does not stand for 50. Now write I after VI which gives VII; this pushes the V one more place to the left but the V is still 5. You see that the value of V does *not* change as its place changes. V is always 5 no matter how many letters you put to the right of it. It is clear that the Roman system does *not* have place value.

V
VI
VII
VIII

8. Here are some other Roman numbers showing X in 3 different positions, or places. Tell the value of X in each of these numbers. Also tell the value of V in each of these numbers.

XV
XVI
XVII

9. In our system of writing numbers, it is the place value that makes it easy to add numbers as we do, because the *ones* are written under the *ones*, the *tens* under the *tens*, the *hundreds* under the *hundreds*, and so on.

But in the Roman system, which has no place value, you cannot add ones to ones and tens to tens because they are not in columns under each other. It is easy to add the Arabic numbers at the right but you cannot add the Roman numbers as they stand.

Arabic	*Roman*
67	LXVII
209	CCIX
16	XVI

10. Since numbers written in the Roman system cannot be added in columns, using a pencil as we do, the Romans had to do addition and other arithmetical operations mechanically on an abacus which consisted of beads that slide on wires. Even today many Chinese do their computing on a kind of abacus called the *suan pan* which is shown below.

1. It is important to be able to look over a problem and tell *about* what the answer should be before you start the work. When you find *about* how much the answer should be you are *estimating* the answer. Estimating the answer to a problem before you work it may help you to avoid a foolish mistake.

2. Jack wanted 2 sweaters which cost $1.98 apiece. He wanted to know how much they would cost.

Jack did the work as shown at the right. Mary said, "Your answer is wrong because $1.98 is almost $2.00, so 2 sweaters will cost about $4.00. Your answer is $2.96 which is about $3.00." Mary is right.

$$\begin{array}{r} \$1.98 \\ 2 \\ \hline \$2.96 \end{array}$$

3. Helen wanted to know how much 2 pairs of stockings would cost if one pair costs $.95 and the other pair costs $.75.

Helen thought, "$.95 is almost $1.00 so both pairs will cost about $1.75."

Estimate the answer to each problem. Then work the problem and get the exact answer:

4. If 1 pair of skates costs $2.97, how much will 3 pairs of skates cost?

5. George has saved $15 toward a bicycle. The bicycle he wants costs $24.95. How much more money does he need?

6. Miss Brown told the class that the English books cost $.96 apiece. How much will the books for our class of 30 pupils cost?

7. Four boys shared the cost of a 96-cent box of candy which they gave their mother. How much did each boy pay?

8. Jane's mother bought a dress for $11.98 and a hat for $3.95. How much did both cost?

9. It costs $.29 for a ticket to the movies. Alice wants to go and take 2 friends. How much will Alice pay for 3 tickets?

At the end of each problem there are three numbers. Select the number which you think is nearest to the right answer. Then work the problem and compare the answer with the number you selected:

1. Jim's mother bought 3 doz. eggs at $.48 a dozen. How much did the eggs cost? $1.25 $1.50 $2.00

2. An airplane flew 1215 mi. in 6 hr. How many miles an hour did it average? 150 mi. 300 mi. 200 mi.

3. Jane's mother bought 5 yd. of ribbon at $.49 a yard and 4 yd. of lace at $.27 a yard. How much did she pay for both? $3.50 $3.00 $4.00

4. We have a set of 12 books in our class. The cost of the set was $62.40. At that price, what was the cost per book? $6.00 $7.00 $5.00

5. Tom's father says his car travels about 21 mi. on 1 gal. of gasoline. At that rate, how far can he travel on 5 gal. of gasoline? 150 mi. 100 mi. 200 mi.

6. How much change do you get from $10.00 if you pay $6.98 for a dress and $1.98 for a hat? $1.00 $2.00 $3.00

7. Mary is going to Chicago, a distance of 817 mi. If the train travels 43 mi. an hour, how many hours will it take Mary to go to Chicago? 15 hr. 20 hr. 30 hr.

8. A flashlight costs $1.25. How much will 3 flashlights cost? $37.50 $40.00 $3.75

9. Mr. Jones paid $6.20 for 40 electric light bulbs. Find the average price he paid per bulb. $.10 $.15 $.20

10. Henry paid $.74 for a dozen oranges and some grapes. The oranges cost $.45 a dozen. How much did the grapes cost? $.40 $.35 $.30

11. The price of one arithmetic workbook is 24¢ when a number of these books are purchased for schools. What is the total cost of these workbooks for a class of 31 pupils? $75.00 $7.50 $9.00

Add these numbers. Then subtract them:

1.	4846	5930	4267	3008	3899
	1259	486	2258	1999	2479
2.	5424	3711	2000	6536	1433
	1678	1586	1894	1758	869

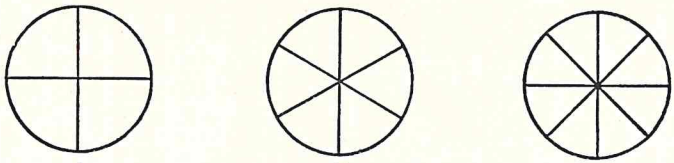
3. Count from 1 to 65 by 2's; by 4's; by 8's.
4. Count from 1 to 55 by 3's; by 6's; by 9's.
5. Beginning with 3, count by 4's to 51.
6. Beginning with 4, count by 5's to 69.
7. Beginning with 2, count by 7's to 58.
8. Beginning with 5, count by 9's to 68.

Multiply and check the work:

9.	32 × \$63.57	201 × 849	430 × 918
10.	49 × \$12.74	358 × 427	179 × 698
11.	65 × \$18.95	576 × 360	800 × 869
12.	87 × \$40.09	198 × 503	607 × 425
13.	50 × \$26.79	400 × 723	265 × 407
14.	26 × \$19.89	716 × 716	304 × 501

Divide and check. Write R before remainders, if any:

15.	1449 ÷ 21	1175 ÷ 25	\$242.00 ÷ 85
16.	1368 ÷ 24	2069 ÷ 43	\$162.54 ÷ 43
17.	2728 ÷ 31	2310 ÷ 35	\$272.18 ÷ 32
18.	2659 ÷ 34	2112 ÷ 33	\$560.64 ÷ 73
19.	3960 ÷ 45	1340 ÷ 23	\$370.98 ÷ 54
20.	1350 ÷ 25	3060 ÷ 45	\$271.52 ÷ 95
21.	2878 ÷ 33	3276 ÷ 42	\$360.38 ÷ 74



A *B* *C*

1. One whole circle may be divided into 4 fourths, as shown at *A*. This shows that $1 = \frac{4}{4}$. A circle may also be divided into 6 sixths, as shown at *B*. This shows that $1 = \frac{6}{6}$.

2. The circle at *C* is divided into eighths. How many eighths make one whole thing? Does $1 = \frac{8}{8}$?

3. How many thirds of a circle are there in one whole circle? This shows that 1 equals what fraction?

4. Mary has 1 pie. If she gives $\frac{3}{8}$ of the pie to John, how many eighths of the pie does she have left?

You must subtract $\frac{3}{8}$ from 1, as shown at *D*. Before you can subtract $\frac{3}{8}$ from 1, you must first change 1 to $\frac{8}{8}$, as shown at *E*. You can then subtract $\frac{3}{8}$ from $\frac{8}{8}$ because both fractions have the same name.

D		*E*
1	=	$\frac{8}{8}$
$\frac{3}{8}$	=	$\frac{3}{8}$
		$\frac{5}{8}$

5. Alice has 1 yd. of cloth to use for her doll's clothes. If she uses $\frac{1}{4}$ yd. for a skirt, how much cloth will be left?

6. Jack had 1 large chocolate bar. He gave $\frac{1}{2}$ of it to Tom. What part of the chocolate bar did Jack have left?

7. Today Bill has to practice 1 hr. on the violin. He practiced $\frac{3}{4}$ hr. before school. What part of an hour should he practice after school?

8. Mary gave $\frac{2}{3}$ of her orange to Alice and Ann. What part of the orange did she have for herself?

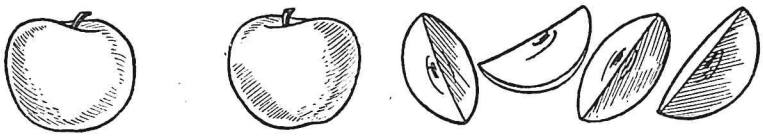
Subtract these numbers:

9.

1	1	1	1	1	1	1	1
$\frac{5}{6}$	$\frac{7}{8}$	$\frac{3}{5}$	$\frac{1}{3}$	$\frac{1}{6}$	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{5}{12}$

1. Here are three whole apples:

If you cut one of the apples into fourths, as shown below, you will have 2 apples and $\frac{4}{4}$ of another apple.



You see that the 3 apples with which you started are the same as $2\frac{4}{4}$ apples. This shows that $3 = 2\frac{4}{4}$.

2. Draw 4 pies. Then divide one of the pies into eighths. Show that 4 pies are the same as 3 pies and $\frac{8}{8}$ of another pie. Does $4 = 3\frac{8}{8}$?

3. Mother had 4 yd. of ribbon. She gave $1\frac{3}{4}$ yd. to Alice. How many yards of ribbon did Mother have left?

Change 4 to $3\frac{4}{4}$. First subtract $\frac{3}{4}$ from $\frac{4}{4}$, which leaves $\frac{1}{4}$. Then subtract 1 from 3, which leaves 2. Mother had $2\frac{1}{4}$ yd. left.

$$\begin{array}{rcl} 4 & = & 3\frac{4}{4} \\ 1\frac{3}{4} & = & 1\frac{3}{4} \\ \hline & & 2\frac{1}{4} \end{array}$$

Subtract. Check the work by going over it:

4.	$4 - \frac{2}{3}$	$5 - \frac{7}{8}$	$6 - 1\frac{3}{4}$	$4 - 2\frac{3}{8}$	$5 - 3\frac{1}{2}$	$7 - 4\frac{5}{12}$	$4 - 3\frac{11}{16}$
5.	$2 - \frac{5}{8}$	$6 - \frac{5}{6}$	$3 - 2\frac{1}{5}$	$7 - 5\frac{1}{6}$	$6 - 4\frac{3}{5}$	$5 - 2\frac{9}{16}$	$8 - 6\frac{3}{10}$
6.	$7 - \frac{3}{4}$	$3 - \frac{3}{8}$	$2 - 1\frac{1}{3}$	$9 - 3\frac{1}{8}$	$7 - 3\frac{1}{4}$	$2 - 1\frac{7}{10}$	$4 - 1\frac{7}{12}$

Subtracting fractions and mixed numbers from whole numbers.

1. You know the number of miles you rode on the train. You also know how many hours the trip took. How do you find the average speed of the train per hour?

2. You know how many balls of yarn you need for a sweater and the cost of one ball. How do you find the cost of all the yarn for a sweater?

3. You know the amount of money you have. You also know you haven't enough to buy the yarn for a sweater. How do you find how much more money you need?

4. You know how much the wire, the boards, and the nails for a rabbit pen cost. How do you find the cost of all these materials?

THE LANGUAGE OF ARITHMETIC

Below each sentence are words or groups of words. Choose the right word or words to complete the sentence:

5. $3\frac{5}{8}$ is called a _____.
   fraction numerator mixed number

6. The 7 of $\frac{7}{8}$ is called the _____.
   denominator numerator whole number

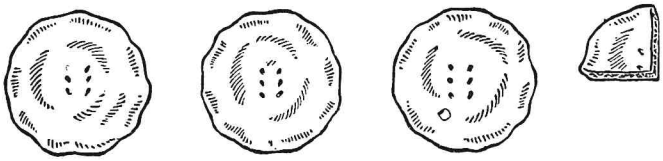
7. The fraction $\frac{11}{8}$ is _____.
   a proper fraction an improper fraction

8. In $260 \div 20 = 13$, 20 is called the _____.
   quotient divisor dividend

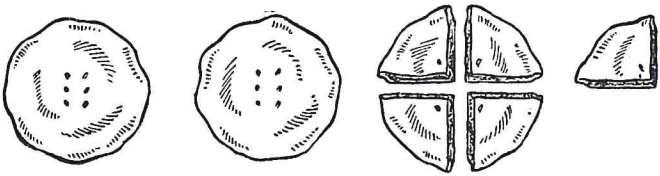
9. When 8, 10, 12, and 6 are added and the sum is divided by 4, the answer is called the _____.
   multiplier numerator average

10. When you multiply 2457 by 23, the answer that you get is called the _____.
   quotient product difference

1. Here are $3\frac{1}{4}$ pies:



If you divide 1 of the pies into quarters, you then get



You see that $3\frac{1}{4}$ pies $= 2\frac{5}{4}$ pies.

2. Draw a picture to show that $3\frac{5}{6}$ pies $= 2\frac{11}{6}$ pies.

3. Mary had $5\frac{1}{4}$ lb. of sugar. She used $1\frac{3}{4}$ lb. to make some candy. How many pounds of sugar did she have left?

Since you cannot subtract $\frac{3}{4}$ from $\frac{1}{4}$, change $5\frac{1}{4}$ to $4\frac{5}{4}$. You can then subtract $\frac{3}{4}$ from $\frac{5}{4}$ and 1 from 4. The answer is $3\frac{2}{4}$ or $3\frac{1}{2}$. Mary has $3\frac{1}{2}$ lb. of sugar left.

$$\begin{array}{rcl} 5\frac{1}{4} & = & 4\frac{5}{4} \\ \underline{1\frac{3}{4}} & = & \underline{1\frac{3}{4}} \\ & & 3\frac{2}{4} = 3\frac{1}{2} \end{array}$$

Subtract. Check by going over the work:

4.
$$\begin{array}{ccccccc} 1\frac{1}{4} & 3\frac{1}{3} & 4\frac{1}{6} & 4\frac{1}{8} & 3\frac{5}{12} & 6\frac{3}{10} & 7\frac{3}{16} \\ \underline{\frac{3}{4}} & \underline{\frac{2}{3}} & \underline{\frac{5}{6}} & \underline{1\frac{7}{8}} & \underline{2\frac{11}{12}} & \underline{3\frac{7}{10}} & \underline{4\frac{7}{16}} \end{array}$$

5.
$$\begin{array}{ccccccc} 2\frac{5}{8} & 6\frac{1}{4} & 4\frac{1}{8} & 9\frac{2}{5} & 6\frac{7}{16} & 8\frac{1}{12} & 4\frac{7}{12} \\ \underline{\frac{7}{8}} & \underline{\frac{2}{4}} & \underline{\frac{3}{8}} & \underline{4\frac{4}{5}} & \underline{2\frac{11}{16}} & \underline{5\frac{11}{12}} & \underline{3\frac{11}{12}} \end{array}$$

6.
$$\begin{array}{ccccccc} 4\frac{1}{5} & 7\frac{3}{8} & 3\frac{1}{6} & 2\frac{1}{3} & 5\frac{5}{12} & 9\frac{1}{10} & 6\frac{5}{16} \\ \underline{\frac{3}{5}} & \underline{\frac{7}{8}} & \underline{\frac{4}{6}} & \underline{1\frac{2}{3}} & \underline{2\frac{7}{12}} & \underline{6\frac{9}{10}} & \underline{5\frac{9}{16}} \end{array}$$

Subtraction with like denominators when the fraction in the minuend is less than that in the subtrahend.

1. Tom ran a race in $12\frac{3}{5}$ sec. Bill came in second and his time was $13\frac{1}{5}$ sec. How many seconds shorter was Tom's time than Bill's?

2. Mary bought some lamb chops for her mother. She asked for $2\frac{1}{2}$ lb. but the clerk had only $1\frac{3}{4}$ lb. How many pounds less did Mary get than she wanted?

3. Betty's dress pattern calls for $2\frac{7}{8}$ yd. of material. At a sale Betty saw a piece of material that was $3\frac{1}{8}$ yd. long. How much extra material would Betty have if she bought this piece? Do you think she would have any use for the extra material?

4. Each week Mr. Thompson goes by train to Portland on business. The train he takes usually makes the trip in $7\frac{3}{4}$ hr. Today the train took $8\frac{1}{4}$ hr. How many hours late was the train today? How many minutes is this?

5. Ann wanted to make candy for the food sale at school. She needed $2\frac{1}{3}$ cups of sugar but when she measured the sugar in the box she had only $1\frac{2}{3}$ cups. How much more sugar did she need?

Subtract. Check by going over the work:

6. $2\frac{1}{6}$	$4\frac{2}{8}$	$9\frac{3}{16}$	$7\frac{1}{16}$	$8\frac{1}{12}$	$2\frac{9}{16}$	$9\frac{7}{10}$
$\frac{5}{6}$	$\frac{7}{8}$	$7\frac{11}{16}$	$4\frac{13}{16}$	$4\frac{5}{12}$	$1\frac{15}{16}$	$6\frac{9}{10}$
7. $3\frac{3}{8}$	$6\frac{3}{7}$	$8\frac{5}{16}$	$4\frac{1}{12}$	$7\frac{1}{10}$	$5\frac{1}{12}$	$6\frac{11}{16}$
$\frac{6}{8}$	$\frac{6}{7}$	$3\frac{15}{16}$	$2\frac{6}{12}$	$2\frac{5}{10}$	$4\frac{4}{12}$	$1\frac{15}{16}$
8. $1\frac{1}{9}$	$8\frac{2}{6}$	$6\frac{9}{16}$	$8\frac{3}{10}$	$6\frac{7}{16}$	$3\frac{1}{12}$	$9\frac{9}{12}$
$\frac{8}{9}$	$\frac{5}{6}$	$4\frac{11}{16}$	$6\frac{5}{10}$	$2\frac{9}{16}$	$2\frac{7}{12}$	$4\frac{11}{12}$
9. $5\frac{1}{4}$	$7\frac{3}{5}$	$9\frac{3}{16}$	$6\frac{1}{16}$	$5\frac{4}{10}$	$8\frac{7}{16}$	$7\frac{5}{16}$
$\frac{3}{4}$	$\frac{4}{5}$	$5\frac{13}{16}$	$3\frac{3}{16}$	$\frac{9}{10}$	$1\frac{15}{16}$	$3\frac{7}{16}$

Tell what number should go in each space:

1. 1 bu. = . . . pk. 8 qt. = . . . pk. 3 pk. = . . . bu.
2. 1 hr. = . . . min. 4 mo. = . . . yr. 4 oz. = . . . lb.
3. $\frac{3}{4}$ lb. = . . . oz. 8 pt. = . . . qt. 9 in. = . . . yd.
4. $\frac{2}{3}$ yd. = . . . in. 2 da. = . . . hr. 2 qt. = . . . gal.

5. Try to say the answers to the addition facts on page 4 in 3 min. Try to say the answers to the subtraction facts on page 10 in 3 min. Use the facts on page 4 as multiplication facts and try to say the answers in 3 min. Try to say the answers to the division facts on page 39 in 3 min.

6. Add 7 to each number below. Add 8; add 9:

43	75	81	16	37	59	92	64
39	18	46	95	63	54	27	49

7. Multiply each number by 7 and add 4 to the result:

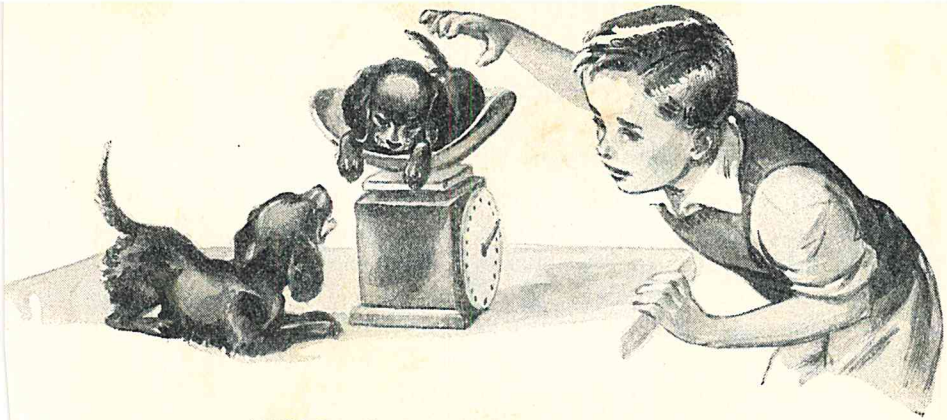
6	4	1	0	7	9	3	5	2	8

8. Multiply each number in ex. 7 by 9 and add 6.
9. Beginning with 11, count by 8's to 75.
10. Beginning with 24, count by 9's to 78.

Add the fractions in each pair. Reduce answers to lowest terms:

11. $\frac{2}{3}, \frac{1}{3}$ $\frac{5}{8}, \frac{1}{8}$ $\frac{3}{4}, \frac{1}{4}$ $\frac{7}{12}, \frac{1}{12}$ $\frac{9}{10}, \frac{3}{10}$ $\frac{5}{16}, \frac{3}{16}$
12. $\frac{5}{6}, \frac{1}{6}$ $\frac{7}{8}, \frac{3}{8}$ $\frac{3}{5}, \frac{1}{5}$ $\frac{7}{10}, \frac{1}{10}$ $\frac{11}{16}, \frac{7}{16}$ $\frac{11}{12}, \frac{5}{12}$

13. In ex. 11 and 12 subtract the two fractions in each pair. Reduce answers to lowest terms.
14. Find the time between 4:06 P.M. and 4:40 P.M.
15. Which is more, $1\frac{1}{2}$ lb. or 28 oz.?
16. Which is less, $\frac{3}{4}$ yd. or 24 in.?
17. Change these improper fractions to mixed numbers: $\frac{15}{4}, \frac{25}{6}, \frac{16}{5}, \frac{17}{3}, \frac{11}{2}, \frac{16}{6}, \frac{42}{8}, \frac{12}{9}$.



WEIGHING THE PUPPIES

1. Tom has two puppies, Spot and Wiggles. Spot weighs $4\frac{1}{4}$ lb. Wiggles weighs $3\frac{1}{2}$ lb. How much more does Spot weigh than Wiggles?

In *A* you see that you must change $3\frac{1}{2}$ to $3\frac{2}{4}$ so that both fractions have the same denominator. But you cannot subtract $\frac{2}{4}$ from $\frac{1}{4}$ so you must change $4\frac{1}{4}$ to $3\frac{5}{4}$ as shown in *B*. Then you can subtract $\frac{2}{4}$ from $\frac{5}{4}$, which gives $\frac{3}{4}$. You also subtract 3 from 3 which leaves no whole number in the answer. Spot weighs $\frac{3}{4}$ lb. more than Wiggles.

A		*B*
$4\frac{1}{4}$	=	$3\frac{5}{4}$
$3\frac{1}{2}$	=	$3\frac{2}{4}$
		$\frac{3}{4}$

2. A few weeks ago Spot weighed only $2\frac{1}{8}$ lb. and Wiggles weighed $1\frac{3}{4}$ lb. Find the difference in their weights then.

Subtract. Check the work by going over it:

3.	$3\frac{1}{8}$	$4\frac{3}{8}$	$5\frac{1}{6}$	$7\frac{5}{12}$	$9\frac{1}{8}$	$4\frac{1}{10}$	$8\frac{3}{16}$
	$1\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{3}$	$2\frac{3}{4}$	$4\frac{3}{4}$	$1\frac{1}{2}$	$4\frac{1}{2}$
4.	$8\frac{1}{4}$	$6\frac{3}{10}$	$4\frac{1}{12}$	$5\frac{5}{8}$	$8\frac{5}{16}$	$6\frac{1}{6}$	$7\frac{7}{12}$
	$3\frac{1}{2}$	$1\frac{4}{5}$	$3\frac{1}{6}$	$3\frac{3}{4}$	$1\frac{7}{8}$	$4\frac{1}{2}$	$5\frac{2}{3}$
5.	$7\frac{3}{8}$	$9\frac{1}{16}$	$3\frac{1}{10}$	$8\frac{7}{12}$	$6\frac{1}{8}$	$8\frac{3}{10}$	$4\frac{1}{12}$
	$2\frac{3}{4}$	$6\frac{1}{4}$	$2\frac{3}{5}$	$2\frac{5}{6}$	$3\frac{1}{2}$	$5\frac{2}{5}$	$2\frac{1}{2}$

Subtraction with unlike denominators when the fraction in the minuend is less than that in the subtrahend.

1. Subtract $4\frac{7}{8}$ from $6\frac{1}{4}$.

In *A* you see that you cannot subtract *eighths* from *fourths*, so you change the fourths to eighths, as shown at *B*. But you cannot subtract $\frac{7}{8}$ from $\frac{2}{8}$ so you change $6\frac{2}{8}$ to $5\frac{10}{8}$, as shown at *C*. You can then subtract $\frac{7}{8}$ from $\frac{10}{8}$, which gives $\frac{3}{8}$. You also subtract 4 from 5, which gives 1.

A		*B*		*C*
$6\frac{1}{4}$	=	$6\frac{2}{8}$	=	$5\frac{10}{8}$
$4\frac{7}{8}$	=	$4\frac{7}{8}$	=	$4\frac{7}{8}$
				$1\frac{3}{8}$

2. Show how to change $3\frac{2}{3}$ to $2\frac{10}{6}$. Show how to change $5\frac{1}{2}$ to $4\frac{6}{4}$. Show how to change $5\frac{1}{2}$ to $4\frac{15}{10}$.

Tell what numbers to put in place of the stars:

3. $4\frac{1}{4} = 4\frac{*}{8} = 3\frac{*}{8}$ $\quad 7\frac{1}{2} = 7\frac{*}{4} = 6\frac{*}{4}$ $\quad 8\frac{1}{6} = 8\frac{*}{12} = 7\frac{*}{12}$
4. $2\frac{1}{3} = 2\frac{*}{6} = 1\frac{*}{6}$ $\quad 5\frac{3}{4} = 5\frac{*}{8} = 4\frac{*}{8}$ $\quad 3\frac{1}{5} = 3\frac{*}{10} = 2\frac{*}{10}$
5. $8\frac{1}{2} = 8\frac{*}{8} = 7\frac{*}{8}$ $\quad 6\frac{1}{2} = 6\frac{*}{16} = 5\frac{*}{16}$ $\quad 7\frac{1}{8} = 7\frac{*}{16} = 6\frac{*}{16}$
6. $5\frac{5}{6} = 5\frac{*}{12} = 4\frac{*}{12}$ $\quad 4\frac{3}{5} = 4\frac{*}{10} = 3\frac{*}{10}$ $\quad 6\frac{1}{2} = 6\frac{*}{10} = 5\frac{*}{10}$

Subtract. Check the work by going over it:

7.	$8\frac{1}{2}$	$3\frac{3}{4}$	$6\frac{1}{2}$	$7\frac{5}{8}$	$9\frac{1}{2}$	$4\frac{1}{3}$	$7\frac{1}{2}$
	$3\frac{13}{16}$	$2\frac{11}{12}$	$4\frac{3}{4}$	$3\frac{15}{16}$	$8\frac{9}{16}$	$3\frac{5}{12}$	$1\frac{9}{10}$
8.	$9\frac{1}{4}$	$6\frac{1}{2}$	$4\frac{5}{6}$	$9\frac{1}{3}$	$7\frac{3}{5}$	$5\frac{1}{2}$	$8\frac{1}{8}$
	$6\frac{7}{16}$	$1\frac{7}{12}$	$2\frac{11}{12}$	$3\frac{11}{12}$	$6\frac{9}{10}$	$3\frac{5}{6}$	$6\frac{9}{16}$
9.	$8\frac{1}{2}$	$7\frac{1}{4}$	$9\frac{1}{3}$	$6\frac{1}{2}$	$8\frac{3}{8}$	$6\frac{3}{4}$	$7\frac{2}{3}$
	$1\frac{5}{8}$	$5\frac{3}{8}$	$4\frac{5}{6}$	$5\frac{7}{10}$	$4\frac{11}{16}$	$2\frac{15}{16}$	$2\frac{11}{12}$
10.	$5\frac{7}{8}$	$3\frac{1}{2}$	$9\frac{4}{5}$	$2\frac{2}{3}$	$4\frac{1}{2}$	$8\frac{1}{4}$	$9\frac{1}{5}$
	$2\frac{15}{16}$	$1\frac{15}{16}$	$7\frac{9}{10}$	$1\frac{5}{6}$	$1\frac{11}{16}$	$2\frac{9}{16}$	$5\frac{7}{10}$
11.	$6\frac{1}{2}$	$8\frac{3}{4}$	$9\frac{1}{2}$	$5\frac{3}{8}$	$9\frac{1}{3}$	$7\frac{1}{2}$	$5\frac{1}{4}$
	$3\frac{9}{10}$	$5\frac{13}{16}$	$1\frac{11}{12}$	$4\frac{15}{16}$	$2\frac{7}{12}$	$4\frac{7}{8}$	$1\frac{5}{8}$

1. Jack walks $2\frac{1}{8}$ mi. every day going to school. Bill walks $1\frac{1}{4}$ mi. How much farther does Jack walk going to school than Bill?

2. Mary's mother bought a piece of curtain material containing $15\frac{1}{4}$ yd. She used $13\frac{1}{2}$ yd. for curtains for Mary's room. How much curtain material is left?

3. George swam across the pool in $45\frac{1}{2}$ sec. Tom did it in $51\frac{3}{10}$ sec. How much longer did it take Tom than George to swim across the pool?

4. Mrs. Hill wanted to buy a chicken weighing about $4\frac{1}{2}$ lb. The butcher could give her one that weighed $3\frac{3}{4}$ lb. or one that weighed $5\frac{1}{4}$ lb. She chose the one that weighed $5\frac{1}{4}$ lb. How many more pounds of chicken did Mrs. Hill buy than she had planned?

Subtract. Check the work by going over it:

5.	$6\frac{1}{4}$	$5\frac{1}{8}$	$4\frac{1}{10}$	$2\frac{1}{6}$	$1\frac{1}{8}$	$7\frac{1}{5}$	$3\frac{1}{16}$
	$2\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{3}$	$\frac{1}{4}$	$3\frac{3}{10}$	$2\frac{1}{2}$
6.	$9\frac{1}{6}$	$1\frac{1}{2}$	$8\frac{1}{8}$	$4\frac{1}{12}$	$5\frac{1}{8}$	$6\frac{1}{2}$	$2\frac{1}{3}$
	$7\frac{1}{2}$	$\frac{3}{4}$	$7\frac{3}{4}$	$1\frac{1}{2}$	$3\frac{13}{16}$	$4\frac{7}{10}$	$1\frac{7}{12}$
7.	$1\frac{3}{8}$	$6\frac{1}{4}$	$7\frac{1}{6}$	$9\frac{1}{6}$	$3\frac{1}{10}$	$4\frac{5}{12}$	$3\frac{1}{4}$
	$\frac{1}{2}$	$2\frac{3}{8}$	$5\frac{2}{3}$	$5\frac{5}{12}$	$1\frac{2}{5}$	$2\frac{1}{2}$	$2\frac{11}{16}$
8.	$4\frac{5}{8}$	$1\frac{2}{3}$	$6\frac{1}{12}$	$8\frac{1}{2}$	$7\frac{3}{4}$	$5\frac{3}{16}$	$3\frac{7}{12}$
	$2\frac{3}{4}$	$\frac{5}{6}$	$5\frac{1}{3}$	$5\frac{9}{16}$	$2\frac{13}{16}$	$3\frac{3}{8}$	$1\frac{5}{6}$
9.	$9\frac{1}{2}$	$5\frac{1}{3}$	$4\frac{3}{10}$	$1\frac{5}{12}$	$2\frac{7}{16}$	$7\frac{4}{5}$	$4\frac{1}{2}$
	$3\frac{5}{8}$	$2\frac{5}{6}$	$3\frac{1}{2}$	$\frac{3}{4}$	$1\frac{5}{8}$	$4\frac{9}{10}$	$\frac{15}{16}$
10.	$6\frac{1}{4}$	$4\frac{1}{2}$	$7\frac{1}{4}$	$3\frac{1}{4}$	$6\frac{3}{5}$	$6\frac{3}{16}$	$1\frac{1}{4}$
	$2\frac{7}{8}$	$2\frac{5}{6}$	$2\frac{5}{8}$	$1\frac{5}{16}$	$3\frac{7}{10}$	$5\frac{3}{4}$	$\frac{11}{12}$

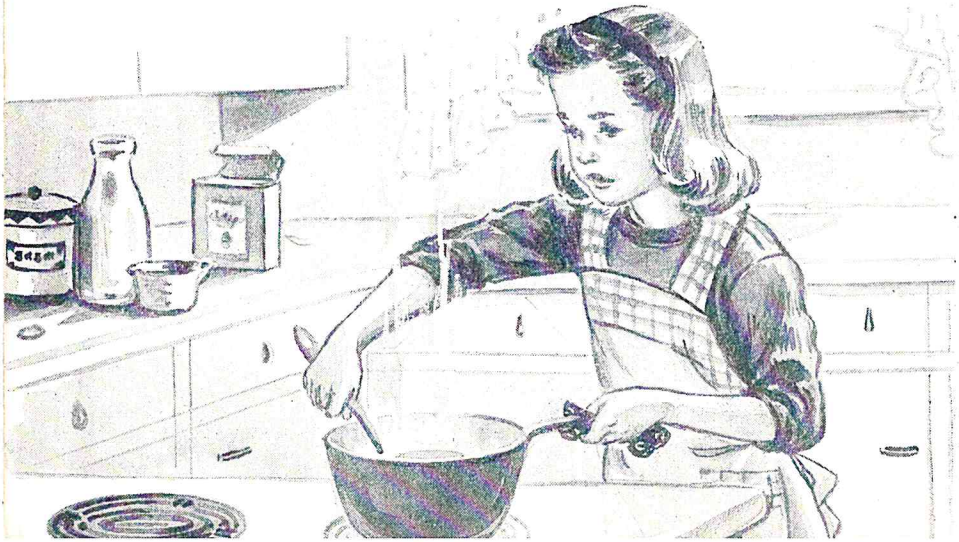
Betty is making some chocolate fudge and some peanut butter fudge to serve at her party. She needs $\frac{2}{3}$ cup of milk for the chocolate fudge and $\frac{1}{2}$ cup of milk for the peanut butter fudge. When Betty looked at the milk bottle she was not sure she had enough milk for both kinds of fudge. How many cups of milk does she need all together?

To find out you must add $\frac{2}{3}$ and $\frac{1}{2}$.

Before you can add $\frac{2}{3}$ and $\frac{1}{2}$, you must change them to fractions having the same denominator. You cannot change $\frac{2}{3}$ to *halves* and you cannot change $\frac{1}{2}$ to *thirds*. But you can change both fractions to *sixths*, so 6 will be the common denominator. 6 is a number large enough to contain both 3 and 2 exactly. You see that 6 is the product of 3 and 2. How do you change $\frac{2}{3}$ to $\frac{4}{6}$? How do you change $\frac{1}{2}$ to $\frac{3}{6}$? When you add $\frac{4}{6}$ and $\frac{3}{6}$ you get $1\frac{1}{6}$. Betty needs $1\frac{1}{6}$ cups of milk.

$$\begin{array}{rcl} \frac{2}{3} & = & \frac{4}{6} \\ \frac{1}{2} & = & \frac{3}{6} \\ \hline & & \frac{7}{6} = 1\frac{1}{6} \end{array}$$

If you cannot see the common denominator of two fractions quickly, you can always get one by multiplying the two denominators together.



Add. Reduce fractions in answers to lowest terms:

1.	$\frac{1}{2}$	$\frac{1}{4}$	$1\frac{1}{5}$	$4\frac{1}{3}$	$2\frac{3}{8}$	$3\frac{1}{8}$	$4\frac{3}{4}$
	$\frac{2}{3}$	$\frac{2}{3}$	$1\frac{1}{2}$	$6\frac{1}{6}$	$1\frac{3}{4}$	$\frac{7}{16}$	$8\frac{1}{3}$
2.	$\frac{1}{2}$	$\frac{7}{8}$	$2\frac{3}{4}$	$3\frac{3}{4}$	$6\frac{1}{3}$	$2\frac{3}{5}$	$2\frac{1}{3}$
	$\frac{3}{10}$	$\frac{1}{2}$	$8\frac{5}{12}$	$3\frac{3}{4}$	$7\frac{1}{2}$	$9\frac{1}{2}$	$2\frac{11}{12}$
3.	$\frac{5}{8}$	$\frac{1}{3}$	$3\frac{3}{4}$	$\frac{5}{6}$	$1\frac{1}{2}$	$4\frac{1}{3}$	$\frac{7}{8}$
	$\frac{1}{8}$	$\frac{3}{4}$	$1\frac{2}{3}$	$7\frac{1}{3}$	$4\frac{2}{5}$	$5\frac{1}{4}$	$1\frac{1}{8}$
4.	$\frac{2}{3}$	$\frac{1}{2}$	$1\frac{1}{4}$	$4\frac{1}{2}$	$3\frac{3}{4}$	$1\frac{1}{3}$	$2\frac{1}{12}$
	$\frac{1}{6}$	$\frac{3}{4}$	$2\frac{1}{3}$	$\frac{2}{5}$	$2\frac{1}{2}$	$1\frac{3}{4}$	$1\frac{7}{12}$
	$\frac{11}{12}$	$\frac{7}{8}$	$1\frac{1}{4}$	$2\frac{3}{10}$	$2\frac{3}{4}$	$1\frac{1}{3}$	$5\frac{1}{12}$

Subtract. Reduce fractions in answers to lowest terms:

5.	$\frac{1}{2}$	$\frac{2}{3}$	$4\frac{2}{3}$	$9\frac{1}{2}$	$3\frac{5}{8}$	$8\frac{3}{4}$	$6\frac{3}{8}$
	$\frac{1}{5}$	$\frac{1}{4}$	$2\frac{1}{2}$	$1\frac{1}{3}$	$2\frac{1}{2}$	$5\frac{1}{3}$	$5\frac{1}{3}$
6.	$\frac{7}{8}$	$\frac{1}{2}$	$6\frac{3}{4}$	$7\frac{1}{2}$	$4\frac{1}{2}$	$8\frac{7}{8}$	$5\frac{1}{5}$
	$\frac{3}{8}$	$\frac{1}{4}$	$3\frac{1}{2}$	$4\frac{7}{8}$	$1\frac{2}{5}$	$7\frac{1}{4}$	$\frac{1}{2}$
7.	$\frac{4}{5}$	$\frac{1}{3}$	$8\frac{3}{4}$	$5\frac{2}{3}$	$6\frac{1}{2}$	$5\frac{3}{5}$	$9\frac{1}{4}$
	$\frac{1}{2}$	$\frac{1}{8}$	$2\frac{2}{3}$	$4\frac{3}{8}$	$\frac{2}{3}$	$2\frac{1}{2}$	$6\frac{2}{3}$
8.	$\frac{2}{3}$	$\frac{1}{3}$	$5\frac{2}{5}$	$8\frac{2}{3}$	$7\frac{1}{3}$	$9\frac{1}{2}$	$4\frac{1}{3}$
	$\frac{1}{2}$	$\frac{1}{4}$	$1\frac{1}{2}$	$4\frac{3}{4}$	$2\frac{1}{2}$	$5\frac{3}{5}$	$3\frac{3}{4}$

9. Sally's mother needs $1\frac{1}{4}$ yd. of cloth for a skirt for Sally, $\frac{7}{8}$ yd. for a jacket, and $\frac{1}{4}$ yd. for a cap. How many yards of material does she need all together?

10. Sally's mother saw a piece of good material that was $2\frac{1}{2}$ yd. long. Was it long enough to make Sally's skirt, jacket, and cap? How much too short or too long was it?

PROBLEMS WITH EXTRA NUMBERS

Each problem contains one or more numbers that are not needed in finding the answer. Tell which numbers are not needed and then solve the problem:

1. Ann bought 5 bananas. They weighed 2 lb. and cost \$.12 a pound. How much did the bananas cost?

2. Mrs. Allen paid \$1.61 for a chicken weighing $3\frac{1}{2}$ lb. and \$.79 for 3 cans of pears. How much in all did she pay for these things?

3. Jim is 10 years old and weighs 64 lb. Dick is 11 years old and weighs 73 lb. What is the difference in their weights?

4. Sally's mother paid \$5.59 for 2 sweaters. She gave the clerk \$10.00. How much change did she get?

5. Helen had \$2.00. She paid \$1.75 for 3 books and \$.15 for a pad. How much was Helen's bill?

6. Mr. Smith shares his car with 3 people each day when he goes to work. He drives a total of 25 mi. a day to work and back. How many miles does he drive in a 6-day week?

7. Jack's father paid \$850 for his car. He used 24 gal. of gasoline on a trip of 432 mi. How many miles per gallon did he average on this trip?

8. Mr. Green bought 3 cherry trees each 4 ft. high at \$1.45 apiece and 2 apple trees each 3 ft. high at \$.94 each. How much did all the trees cost Mr. Green?

9. Mrs. Brown bought a package of 12 paper plates for \$.15, a package of 12 paper cups for \$.10, and a package of 80 paper napkins for \$.15. How much money did she have left from \$1.00?

10. Bill has 25 hens. Last week he gathered 127 eggs. That was an average of about how many eggs a day?

11. Jane's mother bought a piece of cloth containing $2\frac{1}{2}$ yd. for \$1.48 and another piece of the same cloth containing $1\frac{1}{4}$ yd. for \$.74. How many yards of cloth did she buy?

1. $\begin{array}{r} 143 \\ 786 \\ 405 \\ 174 \\ 749 \\ \underline{438} \end{array}$

2. $\begin{array}{r} 428 \\ 637 \\ 29 \\ 145 \\ 360 \\ \underline{482} \end{array}$

3. $\begin{array}{r} \$597.50 \\ \underline{+\ 109.83} \end{array}$

4. $\begin{array}{r} 30174 \\ \underline{-\ 29686} \end{array}$

5. $\begin{array}{r} \$800.00 \\ \underline{-\ 78.65} \end{array}$

6. $\begin{array}{r} 2975 \\ \underline{\times\ 38} \end{array}$

7. $\begin{array}{r} 376 \\ \underline{\times\ 297} \end{array}$

8. $\begin{array}{r} 841 \\ \underline{\times\ 605} \end{array}$

9. $\begin{array}{r} 4\frac{3}{4} \\ \underline{+\ 2\frac{1}{2}} \end{array}$

10. $\begin{array}{r} 11 \\ \underline{-\ 6\frac{2}{3}} \end{array}$

11. $34\overline{)7004}$

12. $26\overline{)11856}$

13. $17\overline{)9690}$

14. $42\overline{)3822}$

15. Write in Roman numerals: 38, 57, 63, 108, 376, 941, 1250, 1383, 1492, 1946.

16. Write in figures: one million, eight hundred fifty-six thousand, ninety-two; five million, forty-six thousand, two hundred seven; six million, two thousand, forty-nine.

17. Find $\frac{2}{3}$ of each number: 18, 27, 21, 15, 24.

18. Reduce to lowest terms: $\frac{4}{6}$, $\frac{4}{8}$, $\frac{8}{10}$, $\frac{6}{12}$, $\frac{8}{12}$, $\frac{14}{16}$.

19. Change to mixed numbers: $\frac{8}{5}$, $\frac{11}{8}$, $\frac{15}{7}$, $\frac{18}{4}$, $\frac{20}{6}$, $\frac{36}{8}$.

20. Change to whole numbers: $\frac{10}{5}$, $\frac{3}{3}$, $\frac{8}{8}$, $\frac{4}{2}$, $\frac{6}{6}$.

21. Draw a circle and divide it into 8 equal parts. Then show that $\frac{1}{2} = \frac{4}{8}$; $\frac{6}{8} = \frac{3}{4}$; $\frac{1}{4} = \frac{2}{8}$; $\frac{1}{2} = \frac{2}{4}$.

22. Find the sum of $3\frac{1}{2}$, $6\frac{3}{8}$, and $7\frac{3}{4}$.

23. Find the difference between $8\frac{1}{3}$ and $4\frac{5}{6}$.

24. How much will 8 oz. of candy cost at 40¢ a pound?

25. What part of a pound is 12 oz.? Find the cost of 12 oz. of cheese at 56¢ a pound.

26. Find the total amount of money in 3 half dollars, 17 quarters, 14 dimes, 11 nickels, and 38 pennies.

27. The distance around a running track is 660 ft. What part of a mile is 660 ft.?

1. Alice weighs $64\frac{1}{2}$ lb. She should weigh 75 lb. for her age and height. How many pounds should Alice gain?

2. A quart jar of one kind of salad dressing costs \$.40. A pint jar of the same kind of salad dressing costs \$.25. How much cheaper is a quart jar than 2 pint jars?

3. How much did Helen pay for $\frac{3}{4}$ yd. of pink ribbon at \$.48 a yard and 3 yd. of blue ribbon at \$.40 a yard?

4. Mrs. Lee bought $3\frac{3}{4}$ lb. of pork, $\frac{1}{2}$ lb. of bacon, and $2\frac{5}{8}$ lb. of beef. How many pounds of meat did she buy?

Can you find any mistakes in ex. 5 and 6? If you find that an example is wrong, work it correctly and check your work:

5.

238	168	720	489
403	850	613	207
714	8400	2160	3423
952	1344	720	978
10234	21840	4320	101203
		52560	

6.

47	357	68	53
39)15873	65)21255	49)33320	66)34986
156	185	294	330
273	375	392	198
273	325	392	198
	505		6
	445		
	60		

Divide and check:

7. 48)12966 66)26800 32)27218 98)36299

8. 83)26892 44)31989 79)24277 53)48813

9. 77)38759 73)39566 57)25200 29)13340

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1. 478	535	763	330	972	307
247	204	415	525	136	514
864	388	576	442	629	757
129	453	884	663	280	170
983	134	157	296	619	917
248	436	205	419	157	271

Subtraction Test

Subtract. Write the answers on folded paper: Time: 3 min.

2. 41192	10000	61637	78696
15235	4276	23593	62532
3. 29514	50364	70003	12133
15475	16388	43085	2517

Multiplication Test

Copy and multiply: Time: 6 min. after copying.*

4. 2704	1683	4950	1548
53	47	92	61
5. 5319	3276	7362	2095
38	19	26	75

Division Test

Copy and divide: Time: 5 min. after copying.*

6. 29)1692	18)3023	37)3254	56)1304
7. 67)3129	46)3125	28)1332	39)2195

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 308.

1. Bill bought a 5-pound bag of sugar for his mother. She used $1\frac{1}{2}$ lb. for candy and $\frac{3}{4}$ lb. for cookies. How many pounds of sugar were left?

2. When Jim rides his bicycle to Shady Farm it takes $\frac{3}{4}$ hr. on the new road. When he rides on the old road it takes 1 hr. How much longer does it take by the old road?

3. Ann's father went to Boston by train in $11\frac{1}{2}$ hr. He flew back by airplane in $3\frac{3}{4}$ hr. Find the difference in time for the two trips.

4. Margaret practices her piano lesson $1\frac{1}{2}$ hr. on Saturdays and $\frac{3}{4}$ hr. each school day. How much longer does she practice on Saturday than on a school day?

What numbers should be put in place of the stars?

5. $4\frac{1}{2} = 4\frac{*}{4} = 3\frac{*}{4}$ $\quad 3\frac{1}{3} = 3\frac{*}{6} = 2\frac{*}{6}$ $\quad 7\frac{3}{4} = 7\frac{*}{12} = 6\frac{*}{12}$

6. $6\frac{3}{8} = 6\frac{*}{16} = 5\frac{*}{16}$ $\quad 2\frac{1}{4} = 2\frac{*}{16} = 1\frac{*}{16}$ $\quad 5\frac{3}{5} = 5\frac{*}{10} = 4\frac{*}{10}$

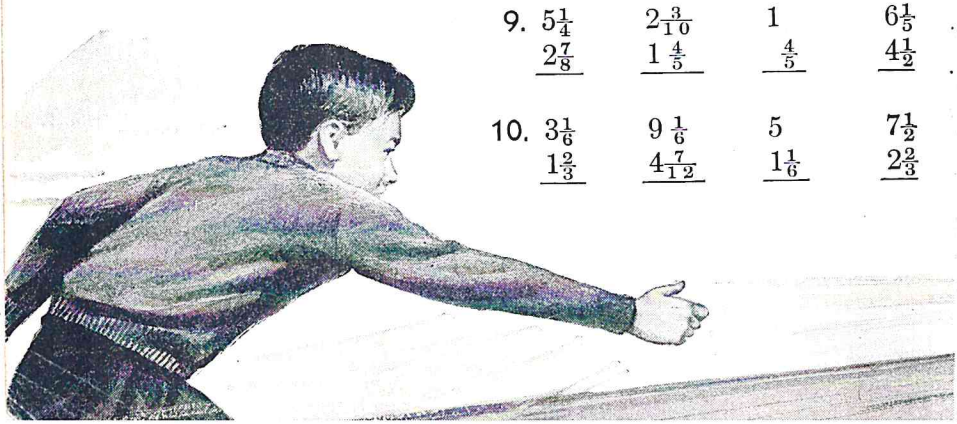
Subtract. Check the work by going over it:

7. $6\frac{1}{4} - 2\frac{1}{2}$ $\quad 3\frac{5}{12} - \frac{2}{3}$ $\quad 1 - \frac{3}{8}$ $\quad 4\frac{1}{16} - 2\frac{3}{8}$ $\quad 7\frac{1}{12} - 5\frac{1}{4}$ $\quad 4\frac{2}{3} - \frac{3}{4}$ $\quad 6\frac{1}{8} - \frac{5}{8}$

8. $4 - 1\frac{1}{2}$ $\quad 8\frac{1}{3} - 4\frac{5}{6}$ $\quad 4\frac{5}{16} - 3\frac{3}{4}$ $\quad 7 - 4\frac{2}{3}$ $\quad 5\frac{1}{4} - 3\frac{3}{4}$ $\quad 8 - 3\frac{3}{4}$ $\quad 7\frac{1}{3} - 3\frac{3}{4}$

9. $5\frac{1}{4} - 2\frac{7}{8}$ $\quad 2\frac{3}{10} - 1\frac{4}{5}$ $\quad 1 - \frac{4}{5}$ $\quad 6\frac{1}{5} - 4\frac{1}{2}$

10. $3\frac{1}{6} - 1\frac{2}{3}$ $\quad 9\frac{1}{6} - 4\frac{7}{12}$ $\quad 5 - 1\frac{1}{6}$ $\quad 7\frac{1}{2} - 2\frac{2}{3}$



1. An airplane flew a distance of 2940 mi. in 12 hr. What was the average number of miles it flew per hour?

2. Mrs. Day bought $2\frac{1}{4}$ lb. of bananas and $3\frac{1}{2}$ lb. of oranges. How many pounds of fruit did she buy?

3. Betty's mother bought a piece of material containing 5 yd. She used $3\frac{7}{8}$ yd. for a dress. How many yards of material did she have left?

4. Ann's brother gets a salary of $3000 a year. How much is that a month?

5. Mrs. White's grocery bill for each of the last 4 weeks was $12.50, $11.90, $14.05, and $13.75. What was the average cost of groceries per week for the 4 weeks?

6. If a train averages 42 mi. an hour, how many hours will it take to travel a distance of 2268 mi.?

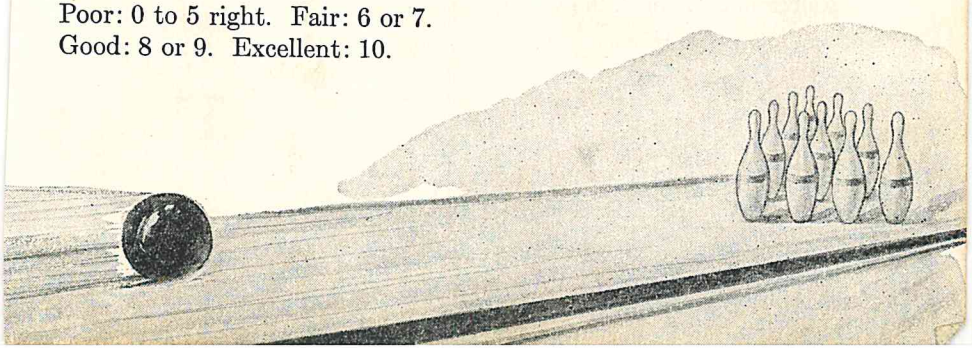
7. Mr. King will make a trip to Denver on Tuesday. The distance is 297 mi. He averages 33 mi. an hour in his car. If he travels 6 hr. before lunch, about how many miles will he have left to travel after lunch?

8. Mrs. Brown used 61 qt. of milk last month. How much was her milk bill at $.15 a quart?

9. Bill bought these things for his mother: 2 cans of corn at $.13 a can, a dozen eggs for $.45, and a loaf of bread for $.12. How much change did he get from $1.00?

10. When Jack's father started on a trip the speedometer of his car read 12,635 mi. After the trip it read 13,214 mi. How many miles did he travel?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Read these numbers: LXXV, XCIX, DCCLII, CDXXV, XLIX, CMX, MDCCC, MCMXLV, MCMII.

2. Bill has \$5. If he spends \$2.98 for a pair of skates and \$.98 for mittens, will he have about \$2 or about \$1 left?

3. About how much should you pay for 2 doz. oranges at \$.49 a dozen?

4. Tell what numbers should be put in place of the stars:

$2\frac{1}{3} = 2\frac{*}{6} = 1\frac{*}{6}$ $\quad 8\frac{3}{4} = 8\frac{*}{16} = 7\frac{*}{16}$ $\quad 4\frac{2}{3} = 4\frac{*}{12} = 3\frac{*}{12}$

5. Change to mixed numbers: $\frac{41}{5}$, $\frac{15}{6}$, $\frac{25}{4}$, $\frac{21}{16}$, $\frac{25}{12}$.

6. What is the common denominator when you add $\frac{2}{3}$ and $\frac{3}{4}$? when you add $\frac{1}{2}$ and $\frac{2}{3}$?

7. What is the common denominator when you subtract $\frac{1}{5}$ from $\frac{1}{2}$? when you subtract $\frac{1}{4}$ from $\frac{1}{3}$?

8. By what number do you multiply both numerator and denominator of $\frac{2}{3}$ to change $\frac{2}{3}$ to $\frac{8}{12}$? Does $\frac{2}{3} = \frac{8}{12}$?

9. Find the difference between $5\frac{1}{2}$ and $4\frac{2}{3}$.

10. What is the sum of $2\frac{1}{2} + 3\frac{5}{6} + 1\frac{1}{12}$? of $\frac{1}{2} + \frac{2}{5} + \frac{9}{10}$?

Divide and check the work:

11. $82\overline{)4346}$ $\quad 54\overline{)19825}$ $\quad 15\overline{)12795}$ $\quad 18\overline{)10319}$

12. $44\overline{)3745}$ $\quad 26\overline{)15418}$ $\quad 37\overline{)25419}$ $\quad 16\overline{)10359}$

13. $75\overline{)6619}$ $\quad 79\overline{)45881}$ $\quad 29\overline{)11780}$ $\quad 19\overline{)16435}$

Subtract and check the work:

14.

4	1	$2\frac{1}{4}$	$5\frac{5}{16}$	$7\frac{3}{4}$	$4\frac{3}{10}$	$9\frac{1}{12}$
$\frac{2}{3}$	$\frac{5}{8}$	$1\frac{3}{4}$	$4\frac{13}{16}$	$\frac{7}{8}$	4	$7\frac{5}{12}$

15.

$6\frac{1}{3}$	$4\frac{1}{2}$	$5\frac{1}{3}$	$3\frac{1}{4}$	$2\frac{1}{2}$	$7\frac{9}{16}$	$5\frac{1}{3}$
$2\frac{1}{4}$	$3\frac{1}{5}$	$4\frac{1}{2}$	$1\frac{2}{3}$	$1\frac{3}{5}$	$4\frac{3}{8}$	$2\frac{1}{12}$

If you miss more than one example in any row, turn to the Practice Pages for that row:

Divide and check the work:

			PRACTICE PAGES
1. $36\overline{)24400}$	$48\overline{)30975}$	$69\overline{)25409}$	141
2. $66\overline{)60997}$	$26\overline{)10998}$	$27\overline{)14769}$	161
3. $29\overline{)19724}$	$33\overline{)12218}$	$58\overline{)54543}$	162
4. $47\overline{)23845}$	$65\overline{)39130}$	$48\overline{)24392}$	163
5. $14\overline{)10332}$	$18\overline{)17028}$	$16\overline{)11152}$	167

What numbers should be put in place of the stars?

6. $7 = 6\frac{*}{4}$	$3 = 2\frac{*}{16}$	178
7. $3\frac{1}{2} = 2\frac{*}{2}$	$7\frac{5}{12} = 6\frac{*}{12}$	180
8. $9\frac{3}{4} = 9\frac{*}{8} = 8\frac{*}{8}$	$4\frac{1}{5} = 4\frac{*}{10} = 3\frac{*}{10}$	184

Subtract. Check the work by going over it:

9.	$1 - \frac{1}{2}$	$1 - \frac{3}{4}$	$4 - \frac{9}{10}$	$9 - \frac{5}{6}$	$6 - \frac{15}{16}$	177, 178
10.	$6\frac{1}{8} - 4\frac{5}{8}$	$5\frac{1}{6} - 4\frac{5}{6}$	$9\frac{3}{10} - 2\frac{9}{10}$	$8\frac{1}{4} - 3\frac{3}{4}$	$7\frac{11}{16} - 1\frac{15}{16}$	180, 181
11.	$2\frac{1}{2} - 1\frac{3}{4}$	$3\frac{3}{4} - 2\frac{7}{8}$	$6\frac{5}{16} - 4\frac{3}{4}$	$7\frac{1}{6} - 3\frac{2}{3}$	$4\frac{1}{5} - 3\frac{7}{10}$	183, 184
12.	$4\frac{1}{3} - 2\frac{1}{2}$	$6\frac{1}{2} - 2\frac{1}{5}$	$8\frac{2}{3} - 7\frac{1}{4}$	$9\frac{2}{3} - 4\frac{3}{4}$	$10\frac{1}{2} - 5\frac{2}{3}$	187

Diagnostic test.

CHAPTER SIX

Using Fractions in Multiplication

BOARDING DOGS

1. Joe lives in a house with a large yard. He has opened a boarding house for dogs and will take care of dogs when their owners are away. He is boarding 5 dogs at present. Curly is a very small dog; Fido and Spot are larger dogs, while Jack and Reddy are still larger. The amount of food Joe gives each dog depends upon the dog's weight. This table shows the amount of food each dog gets per day:

Curly	$\frac{1}{2}$ lb.	Spot	1 lb.	Reddy	2 lb.
Fido	$\frac{3}{4}$ lb.	Jack	$1\frac{3}{4}$ lb.		

How many pounds of food do all 5 dogs eat per day?

2. Joe bought 3 bags of dog food at $4.00 per bag. How much did the 3 bags cost? Each bag holds 50 lb. of food. How many pounds did he buy? How many days will the food last the 5 dogs if they eat 6 lb. a day?

3. If 50 lb. of food cost $4.00, how many cents does the food cost per pound?

4. Curly gets $\frac{1}{2}$ lb. of food per day. How many cents per day does Curly's food cost? See ex. 3. What does the food cost per day for Fido? for Spot? for Reddy? See ex. 1.

5. Jack eats $1\frac{3}{4}$ lb. of food per day. To find the cost of $1\frac{3}{4}$ lb., first find the cost of $\frac{3}{4}$ lb.; then find the cost of 1 lb. and add the two amounts.

6. Ex. 4 and 5 tell how much it costs to feed each dog per day. Find the cost of feeding each dog per week.

1. Every week the owner of each dog pays Joe the cost of the food for his dog and 50¢ extra for taking care of the dog. See page 197. Joe made a table like the one below to show how much each owner should pay him a week.

	Cost of Feed per Day	Cost of Feed per Week	Care per Week	Total Cost per Week
Curly	$.04	$.28	$.50	$.78
Fido	.06	.42	.50	.92
Spot	.08	.56	.50	. . .
Jack	.14	.98	.50	. . .
Reddy	.16	1.12	.50	. . .

The amounts that Joe wrote in the first two columns of the table were found in ex. 4–6, page 197. How did Joe find $.78 and $.92 in the last column? Find the other three amounts for the last column but do not write them in the table. Which column does Joe add to find out how much all together the 5 owners pay him a week? How much is it?

2. Joe thinks he ought to charge 75¢ a week instead of 50¢ for taking care of each dog. If he did that, how much in all would he receive a week from each owner? Make a table like the one above, using 75¢ instead of 50¢.

3. How much more will Joe make per week on 5 dogs if he charges 75¢ instead of 50¢ for the care of each dog?

4. One week Joe had a large dog that needed $3\frac{1}{2}$ lb. of food per day. At 8¢ a pound, how much did the feed for that dog cost per day? per week?

1. Alice needs $\frac{3}{4}$ yd. of material to make an apron. How much will it cost at \$.48 a yard?

An easy way to find $\frac{3}{4}$ of 48 is to think like this:

$$\frac{1}{4} \text{ of } 48 = 12$$
$$\text{so } \frac{3}{4} \text{ of } 48 = 3 \times 12, \text{ or } 36$$

Alice will have to pay \$.36 for $\frac{3}{4}$ yd. of material.

2. When you find $\frac{1}{8}$ of 72, or $\frac{3}{4}$ of 48, you are finding a *fractional part of a number*. In examples like $\frac{1}{8}$ of 72 and $\frac{3}{4}$ of 48, you can do the work in your head because the numbers are not large.

3. What will $\frac{3}{4}$ yd. of cloth cost at \$2.76 a yard?

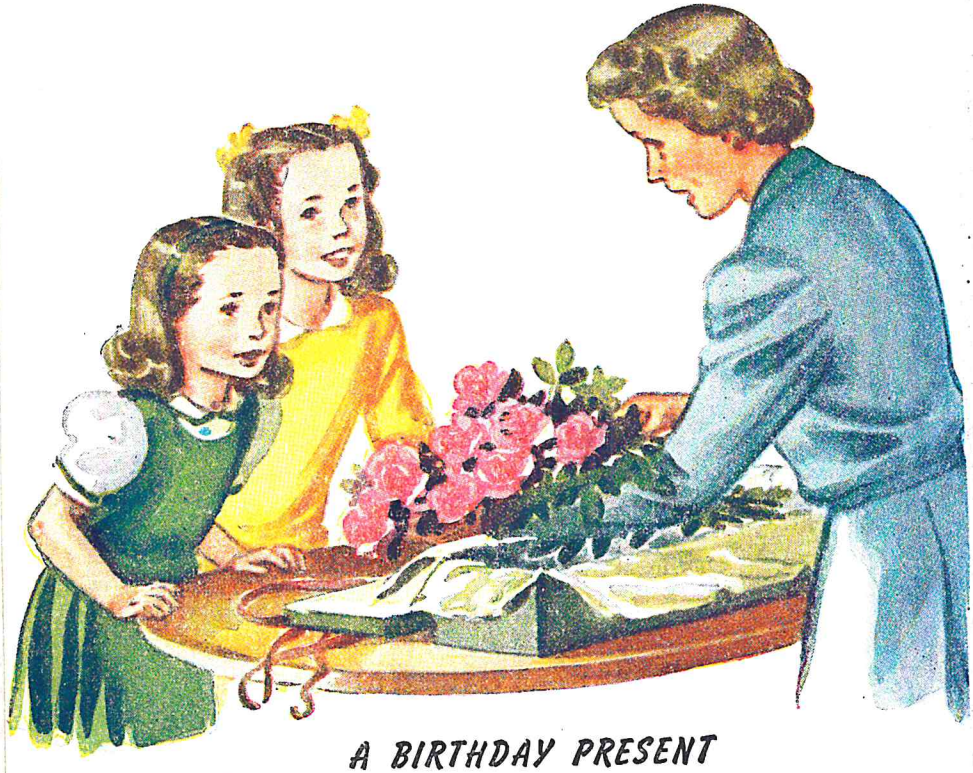
It is not easy to do this example in your head. You can do the work as shown at the right. You find that $\frac{3}{4}$ yd. costs \$2.07.

In the work at *A* the quotient is written *below* the dividend instead of above it. This puts \$.69 in a convenient place so it can be multiplied by 3 at once. When the work is done as at *B*, it is necessary to write \$.69 again before multiplying it by 3. In examples like this it saves time to do the work as at *A*.

A	*B*
4)\$2.76	\$ .69
.69	4)\$2.76
3	
\$2.07	\$ .69
	3
	\$2.07

Multiply. Check the work by going over it:

4.	$\frac{2}{3}$ of 141	$\frac{3}{5}$ of 195	$\frac{3}{4}$ of \$2.32	$\frac{5}{6}$ of \$2.64
5.	$\frac{5}{8}$ of 176	$\frac{7}{8}$ of 360	$\frac{2}{3}$ of \$1.95	$\frac{5}{8}$ of \$1.92
6.	$\frac{4}{5}$ of 265	$\frac{2}{3}$ of 114	$\frac{3}{8}$ of \$2.24	$\frac{3}{4}$ of \$2.92
7.	$\frac{3}{4}$ of 336	$\frac{5}{6}$ of 138	$\frac{2}{3}$ of \$2.16	$\frac{3}{8}$ of \$2.80
8.	$\frac{5}{6}$ of 354	$\frac{2}{5}$ of 130	$\frac{3}{4}$ of \$3.76	$\frac{3}{4}$ of \$3.16
9.	$\frac{3}{8}$ of 272	$\frac{3}{4}$ of 152	$\frac{7}{8}$ of \$3.52	$\frac{2}{3}$ of \$2.85
10.	$\frac{2}{3}$ of 246	$\frac{2}{5}$ of 105	$\frac{3}{8}$ of \$1.20	$\frac{5}{8}$ of \$3.44



A BIRTHDAY PRESENT

1. Ann and Betty bought some roses for their mother's birthday. The girls did not have enough money to pay \$3.00 for a dozen large roses. They asked Mr. Green how much he charged for $\frac{3}{4}$ doz. Do you know the answer?

2. Mr. Green said he had small roses for \$2.00 a dozen. How much would $\frac{3}{4}$ doz. small roses cost at \$2.00 a dozen?

3. The girls had only \$2.00 to spend but they wanted the large roses. Could they get $\frac{2}{3}$ doz. large roses at \$3.00 a dozen? How much would they cost? How many roses are there in $\frac{2}{3}$ doz. roses?

4. An example like $\frac{3}{4}$ of \$3.00 is often written like this: $\frac{3}{4} \times \$3.00$. This is read "$\frac{3}{4}$ times \$3.00" but it means $\frac{3}{4}$ of \$3.00. The sign $\times$ means "of" when it is written *after* a fraction. To find the answer for $\frac{3}{4} \times \$3.00$, the work is done the same way as shown on page 199.

1. Mrs. Ball bought $\frac{3}{4}$ lb. of boiled ham for sandwiches. At 80¢ a pound, how much did she pay for the ham?

2. How many ounces of candy will Jack get if he buys $\frac{3}{4}$ lb. of candy? How much will it cost at 60¢ a pound?

3. Frank and George bought a package of stamps for \$.75. Frank paid $\frac{2}{3}$ of the cost and George paid $\frac{1}{3}$. How much did each boy pay?

4. There were 450 stamps in the package that Frank and George bought. Frank got $\frac{2}{3}$ of the stamps and George got $\frac{1}{3}$. How many stamps did each boy get?

5. A train travels at the rate of 48 mi. an hour. At that rate, how far will it go in 45 min.? in 40 min.?

Multiply these numbers. Check by going over the work:

6.	$\frac{2}{3} \times 39$	$\frac{3}{5} \times 70$	$\frac{3}{4} \times 84$	$\frac{4}{7} \times \$2.80$	$\frac{5}{8} \times \$1.20$
7.	$\frac{3}{4} \times 60$	$\frac{5}{6} \times 54$	$\frac{4}{5} \times 80$	$\frac{7}{8} \times \$4.00$	$\frac{3}{7} \times \$3.64$
8.	$\frac{2}{5} \times 75$	$\frac{5}{8} \times 96$	$\frac{2}{3} \times 60$	$\frac{3}{4} \times \$1.20$	$\frac{3}{8} \times \$2.48$
9.	$\frac{3}{8} \times 88$	$\frac{2}{3} \times 81$	$\frac{3}{4} \times 56$	$\frac{5}{6} \times \$2.70$	$\frac{7}{8} \times \$5.20$
10.	$\frac{4}{5} \times 55$	$\frac{3}{4} \times 72$	$\frac{5}{6} \times 90$	$\frac{2}{3} \times \$1.50$	$\frac{2}{5} \times \$1.00$
11.	$\frac{7}{8} \times 72$	$\frac{3}{5} \times 95$	$\frac{5}{8} \times 40$	$\frac{3}{4} \times \$2.84$	$\frac{2}{3} \times \$3.72$
12.	$\frac{2}{3} \times 45$	$\frac{2}{3} \times 51$	$\frac{3}{4} \times 96$	$\frac{5}{8} \times \$2.80$	$\frac{5}{6} \times \$4.20$
13.	$\frac{3}{8} \times 40$	$\frac{3}{5} \times 60$	$\frac{5}{6} \times 84$	$\frac{2}{5} \times \$1.25$	$\frac{3}{8} \times \$6.48$
14.	$\frac{4}{5} \times 25$	$\frac{7}{8} \times 96$	$\frac{2}{5} \times 65$	$\frac{5}{8} \times \$1.60$	$\frac{4}{7} \times \$4.20$
15.	$\frac{5}{8} \times 56$	$\frac{3}{7} \times 49$	$\frac{3}{8} \times 88$	$\frac{7}{8} \times \$2.56$	$\frac{4}{5} \times \$3.05$

16. In each exercise above the whole number can be divided exactly by the denominator of the fraction. To get each answer you first divide the whole number by the denominator and then multiply the result by the numerator. When the whole number is small, you can usually do all the work in your head.

1. Virginia wants new curtains for her room. She needs $5\frac{3}{4}$ yd. of material. How much will the curtain material cost at \$.48 a yard?

First find $\frac{3}{4}$ of 48, which is 36. Then multiply 48 by 5, which is 240. Be sure to place the 0 of 240 under the 5 by which you multiplied as shown at the right. Then add 36 and 240 and insert the decimal point. The curtain material will cost \$2.76.

$$\begin{array}{r} \$.48 \\ 5\frac{3}{4} \\ \hline 36 \\ 2\,40 \\ \hline \$\,2.76 \end{array}$$

2. Betty's mother bought $2\frac{3}{8}$ yd. of cloth for a dress for Betty. The cloth cost \$1.52 a yard. How much did the cloth for the dress cost?

3. Jack's mother bought a chicken. It weighed $4\frac{3}{4}$ lb. and cost \$.44 a pound. How much did the chicken cost?

4. Mr. Brown bought half a ham. It weighed $6\frac{3}{8}$ lb. and cost \$.40 a pound. How much did he pay for the ham?

5. Bill worked $8\frac{3}{4}$ hr. last week at the grocery store. He earned \$.40 an hour. How much did Bill earn last week?

Multiply. Check the work by going over it:

6.	$3\frac{2}{5} \times 65$	$5\frac{1}{2} \times 42$	$12\frac{2}{3} \times 57$	$4\frac{2}{3} \times \$1.26$
7.	$4\frac{2}{3} \times 78$	$3\frac{5}{8} \times 48$	$14\frac{1}{5} \times 75$	$2\frac{3}{4} \times \$2.08$
8.	$8\frac{5}{6} \times 84$	$7\frac{3}{4} \times 44$	$21\frac{1}{2} \times 58$	$5\frac{1}{2} \times \$1.16$
9.	$5\frac{3}{8} \times 96$	$4\frac{1}{3} \times 69$	$16\frac{3}{4} \times 88$	$3\frac{5}{8} \times \$1.04$
10.	$2\frac{3}{4} \times 76$	$1\frac{7}{8} \times 56$	$11\frac{5}{6} \times 96$	$2\frac{1}{3} \times \$1.56$
11.	$6\frac{1}{5} \times 70$	$2\frac{1}{6} \times 72$	$15\frac{3}{8} \times 24$	$6\frac{3}{8} \times \$2.48$
12.	$9\frac{1}{2} \times 60$	$6\frac{3}{5} \times 40$	$12\frac{3}{4} \times 36$	$1\frac{7}{8} \times \$1.20$

To multiply a whole number by a mixed number, multiply first by the fraction and then by the whole number and add the products.

1. How much must you pay for $\frac{3}{4}$ lb. of cheese if it costs 36¢ a pound? if it costs 37¢ a pound?

If the cheese costs 36¢ a pound, you can *divide* 36 by 4 and *multiply* the result by 3, which gives 27; that is, you *divide first* and then *multiply*. You can get the same answer, however, if you *multiply first* and then *divide*, like this: $3 \times 36 = 108$, $108 \div 4 = 27$. See the work at *A*.

A

$$\begin{array}{r} 36 \\ 3 \\ \hline 4\overline{)108} \\ \hline 27 \end{array}$$

To find the cost of $\frac{3}{4}$ lb. at 37¢ a pound, you can first divide 37 by 4, which gives $9\frac{1}{4}$, and then multiply $9\frac{1}{4}$ by 3, which gives $27\frac{3}{4}$; but you can avoid some of the fractions and get the same answer if first you multiply 37 by 3, which gives 111, and then divide 111 by 4, which gives $27\frac{3}{4}$. See the work at *B*. The cheese costs $27\frac{3}{4}$¢, which is called 28¢. In stores a fraction of a cent is counted as another cent.

B

$$\begin{array}{r} 37 \\ 3 \\ \hline 4\overline{)111} \\ \hline 27\frac{3}{4} \end{array}$$

> To multiply a whole number by a fraction, multiply the whole number by the numerator and divide the result by the denominator.

Multiply. If the answer stands for money, count a fraction of a cent as another cent:

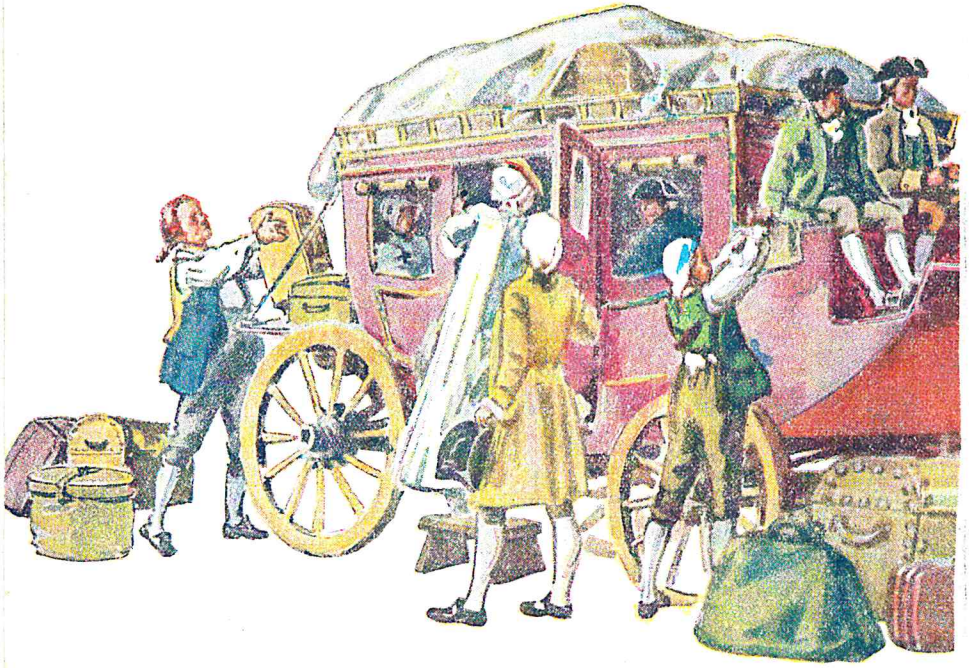
2.	$\frac{3}{8} \times 17$	$\frac{3}{4} \times 39$	$\frac{3}{8} \times 135$	$\frac{2}{3} \times \$.50$	$\frac{5}{6} \times \$2.35$
3.	$\frac{2}{3} \times 11$	$\frac{1}{3} \times 10$	$\frac{3}{4} \times 111$	$\frac{3}{4} \times \$.25$	$\frac{2}{3} \times \$1.75$
4.	$\frac{3}{5} \times 16$	$\frac{5}{8} \times 30$	$\frac{1}{2} \times 125$	$\frac{7}{8} \times \$.15$	$\frac{5}{8} \times \$3.25$
5.	$\frac{1}{4} \times 25$	$\frac{2}{5} \times 31$	$\frac{4}{7} \times 100$	$\frac{3}{4} \times \$.75$	$\frac{3}{7} \times \$8.20$
6.	$\frac{7}{8} \times 35$	$\frac{2}{3} \times 20$	$\frac{4}{5} \times 178$	$\frac{5}{8} \times \$.39$	$\frac{3}{4} \times \$3.50$
7.	$\frac{3}{4} \times 15$	$\frac{5}{6} \times 35$	$\frac{3}{8} \times 133$	$\frac{5}{6} \times \$.25$	$\frac{2}{3} \times \$5.00$
8.	$\frac{2}{7} \times 12$	$\frac{5}{8} \times 25$	$\frac{2}{3} \times 160$	$\frac{2}{3} \times \$.37$	$\frac{7}{8} \times \$2.75$
9.	$\frac{3}{8} \times 13$	$\frac{2}{3} \times 17$	$\frac{1}{3} \times 100$	$\frac{3}{8} \times \$.11$	$\frac{1}{3} \times \$4.00$

Before the year 1750 few persons had the time or the money to go far from home. At first the few travelers there were rode on horseback. Later on people traveled by stagecoach but this was uncomfortable and often dangerous due to the deep holes and mud in the roads.

1. In 1756 the first stagecoach line carried passengers and packages between New York and Philadelphia. It took 3 days to make this trip of 90 mi. What was the average number of miles traveled in a day?

2. By 1771 the roads between New York and Philadelphia were improved and the coaches were better. This made it possible to make the trip in half the former time. How many days did it now take for the trip? See ex. 1.

3. Passengers making the trip between Philadelphia and Baltimore in 1788 could choose either to go by sailboat or by stagecoach. For the last 37 mi. of the journey, passengers



were taken free by the stagecoach in order to compete with the low fare charged by the sailboat. The stagecoach company advertised as follows:

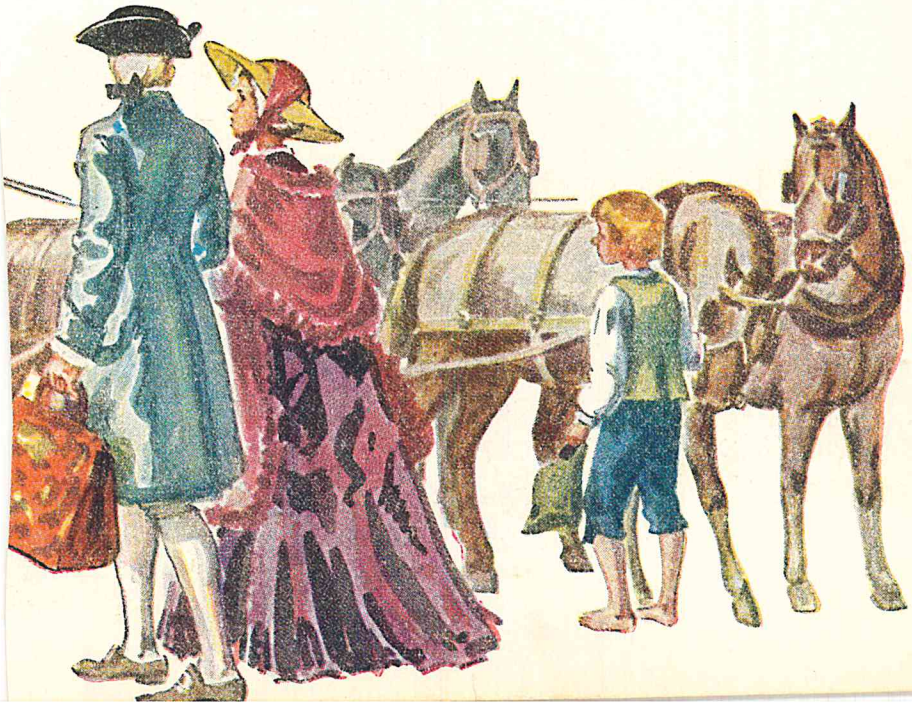
Philadelphia to Chester	15 mi.	$1.25
Chester to Wilmington	13 mi.	$1.24
Wilmington to Elk	22 mi.	$1.89
Elk to Susquehanna	16 mi.	$1.87
Susquehanna to Baltimore	37 mi.	gratis

How many miles was it from Philadelphia to Baltimore? How much was the fare for the through trip?

4. In 1802 one could go by stagecoach from Boston to Savannah, Georgia. How many days in all did it take to make this trip?

Boston to New York	4 days	$10.00
New York to Philadelphia	$1\frac{1}{2}$ days	5.00
Philadelphia to Charleston	15 days	50.00
Charleston to Savannah	2 days	5.00

How much did it cost for the trip from Boston to Savannah?



1. Our class is getting ready to give a play. We need $15\frac{3}{4}$ yd. of material for costumes. How much will the material cost at \$.35 a yard?

First find $\frac{3}{4}$ of 35, which gives $26\frac{1}{4}$. Next multiply 35 by 15; be careful to place the products, 175 and 35, in the positions shown at the right. Then add the products. The answer is $\$5.51\frac{1}{4}$, which you call \$5.52. When you buy things in stores, a fraction of a cent is usually counted as another cent. Check by going over the work. The material for costumes will cost \$5.52.

$$\begin{array}{r} \$\ .35 \\ 15\frac{3}{4} \\ \hline 26\frac{1}{4} \\ 1\ 75 \\ 3\ 5 \\ \hline \$5.51\frac{1}{4} \\ \$5.52 \end{array}$$

2. Study these examples:

A.
$$\begin{array}{r} 45 \\ 8\frac{1}{2} \\ \hline 22\frac{1}{2} \\ 360 \\ \hline 382\frac{1}{2} \end{array}$$

B.
$$\begin{array}{r} 29 \\ 3\frac{1}{3} \\ \hline 9\frac{2}{3} \\ 87 \\ \hline 96\frac{2}{3} \end{array}$$

C.
$$\begin{array}{r} \$\ .61 \\ 5\frac{3}{4} \\ \hline 45\frac{3}{4} \\ 3\ 05 \\ \hline \$3.50\frac{3}{4} \\ \$3.51 \end{array}$$

D.
$$\begin{array}{r} \$1.35 \\ 3\frac{3}{4} \\ \hline 1\ 01\frac{1}{4} \\ 4\ 05 \\ \hline \$5.06\frac{1}{4} \\ \$5.07 \end{array}$$

In examples *A* and *B* shown above the fraction is kept in each answer. In examples *C* and *D* the fraction of a cent in each answer is called another cent. Storekeepers usually count any fraction of a cent as another cent.

Multiply. Check the work by going over it:

3. $4\frac{2}{3} \times 25$	$2\frac{5}{8} \times 55$	$8\frac{1}{3} \times \$.65$	$5\frac{1}{4} \times \$1.25$
4. $5\frac{1}{2} \times 17$	$3\frac{1}{6} \times 75$	$7\frac{3}{4} \times \$.90$	$3\frac{3}{8} \times \$2.24$
5. $3\frac{3}{4} \times 35$	$4\frac{3}{5} \times 48$	$2\frac{1}{6} \times \$.75$	$7\frac{2}{3} \times \$1.78$
6. $8\frac{5}{6} \times 45$	$6\frac{3}{4} \times 50$	$4\frac{3}{8} \times \$.30$	$6\frac{5}{8} \times \$1.50$
7. $3\frac{3}{8} \times 30$	$8\frac{2}{3} \times 56$	$3\frac{1}{2} \times \$.69$	$4\frac{3}{4} \times \$2.69$
8. $5\frac{1}{3} \times 67$	$7\frac{7}{8} \times 27$	$5\frac{5}{8} \times \$.38$	$2\frac{5}{6} \times \$3.20$
9. $6\frac{2}{5} \times 62$	$9\frac{1}{4} \times 46$	$6\frac{7}{8} \times \$.28$	$4\frac{7}{8} \times \$1.60$
10. $2\frac{7}{8} \times 42$	$5\frac{3}{4} \times 75$	$4\frac{1}{2} \times \$.35$	$3\frac{1}{3} \times \$2.00$

In each problem there is a fact you need to know before you can work the problem. Supply a fact that will make a good problem and then work the problem:

1. Henry bought a sweater and then he had $.32 left. How much money did Henry have at first?

2. Ann wants $\frac{1}{4}$ yd. of blue silk for a doll's dress. How much must she pay for it?

3. Jack went to the store for his mother. He bought groceries that cost $2.36 and handed the clerk a bill to pay for them. How much change did Jack get?

4. The girls in the Sewing Club bought 12 yd. of cloth at $.35 a yard. They divided the cost equally. How much did each girl pay?

5. This year there are 2385 pupils in the Weston schools. How many more pupils are there this year than last year?

6. Sally wants to knit a sweater. The yarn costs $.59 a ball. How much will the yarn for her sweater cost?

7. Joe and Fred each have a stamp collection. Joe has 150 stamps more than Fred. How many stamps has Joe?

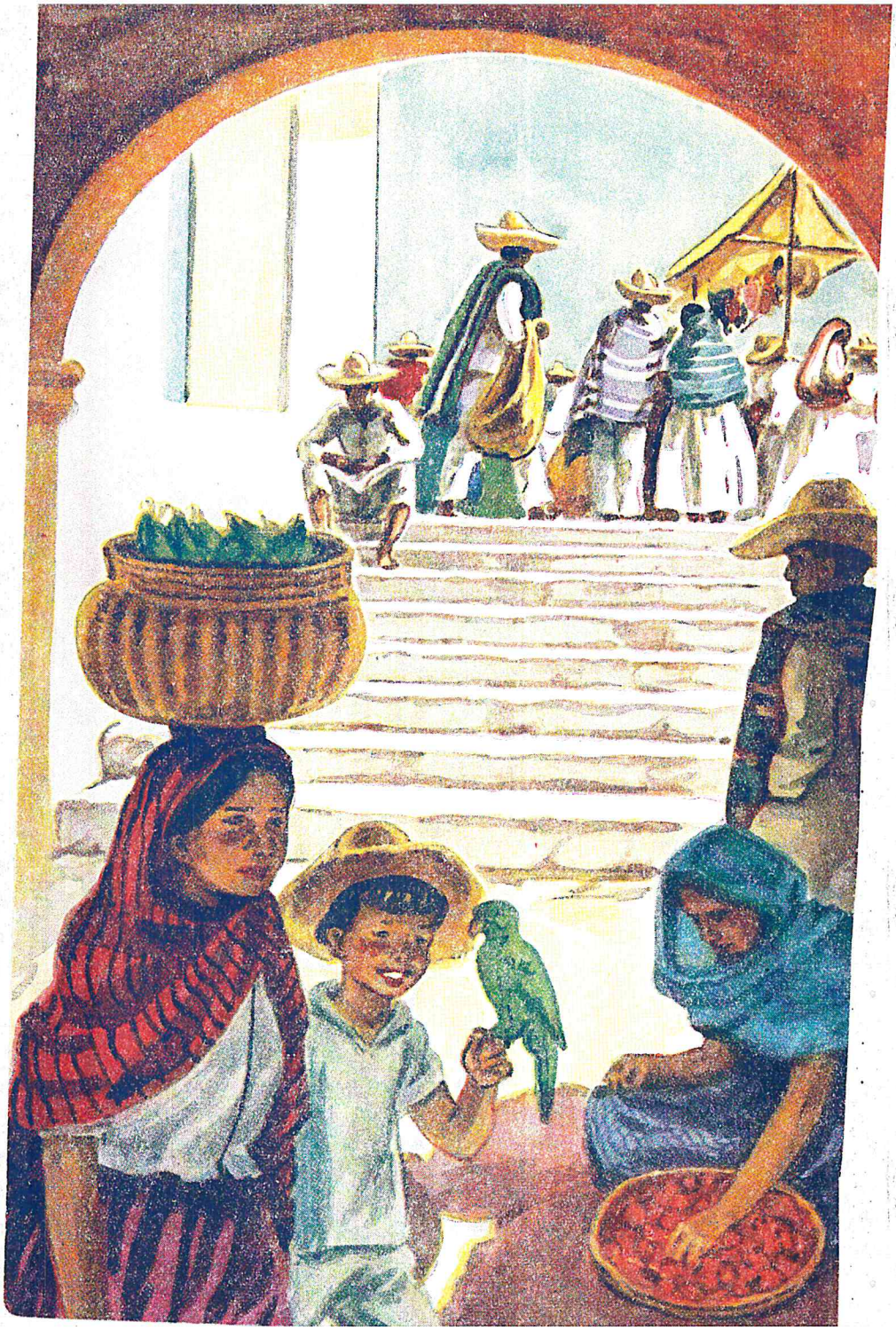
8. Yesterday Bill's father took him on an automobile trip. They made the trip in 5 hr. What was the average number of miles they drove per hour?

9. Mr. White drove 270 mi. on a tank full of gasoline. How many miles did he drive per gallon of gasoline?

10. Mr. Brown bought 2 boxes of pencils to sell in his store. He sold each pencil for 5¢. How much did he get for all the pencils in the two boxes?

11. Tom took enough money out of the bank to buy 2 bicycle tires at $2.29 each. How much money did he have left in the bank?

12. Find the cost of a melon at 9¢ a pound.



1. Our class is making a collection of interesting facts and pictures about Mexico. We have already collected 18 pictures of famous buildings, 10 pictures of volcanoes, 25 pictures of Mexican handwork, 12 pictures showing customs of the people and ways of travel, and 19 pictures of Mexican industries. How many pictures have we collected?

2. The northern boundary of Mexico, between Mexico and the United States, is 1833 mi. long. The southern boundary of Mexico is 134 mi. long. Is the northern boundary about 13 or 14 times as long as the southern boundary?

3. The eastern coast line of Mexico is 1727 mi. long. The western coast line is 4574 mi. long. How much longer is the western coast line than the eastern coast line?

4. The population of Mexico is about 20,000,000 people. The population of the United States is about 140,000,000 people. Read these large numbers. Is our population about 6 or 7 times as large as that of Mexico?

5. The highest mountain in Mexico is Orizaba which is about 18,700 ft. high. The next highest mountain is Popocatepetl which is 17,876 ft. high. What is the difference in height of these two mountains?

6. Is Orizaba about 3 mi. or $3\frac{1}{2}$ mi. high. See ex. 5.

7. The Pan-American highway from Laredo, Texas, to Mexico City was opened in 1936. How many years has this highway been in use?

8. From Laredo, Texas, to Mexico City via the Pan-American Highway is about 750 mi. over mountainous country. At an average speed of 25 mi. an hour, how many hours of driving would it take to go to Mexico City from Laredo, Texas?

9. Mexico City was founded by the Indians in 1325. How many years ago was that?

Copy in columns, add, and check:

1. 62 + 58 + 67 + 34 + 13 + 29 + 48
2. 71 + 98 + 84 + 45 + 59 + 18 + 87
3. 24 + 56 + 79 + 33 + 65 + 53 + 46

Add up. Check the work by adding down:

4.	5266	22377	54825	23064	12175
	5474	75390	82676	4836	36693
	3228	31412	19010	28102	9974
	2717	14426	30249	45645	40255
5.	7655	62345	37453	43981	44412
	3773	6726	81839	8968	55845
	1284	17558	39518	9404	37796
	4601	9767	16000	27989	47507
	7326	52612	24665	36238	24075
6.	2568	17553	21964	53884	17578
	3056	81209	69687	5538	24081
	6732	13988	45996	40464	31954
	2367	2721	10216	43791	64729
	7438	36456	10158	1129	77447

Multiply and check the work:

7.	48 × 89	69 × 5601	246 × 294	639 × 854
8.	73 × 95	42 × 3145	384 × 386	715 × 672
9.	65 × 38	70 × 6218	579 × 924	690 × 961
10.	92 × 97	35 × 4279	280 × 702	383 × 529
11.	50 × 56	81 × 7163	137 × 137	209 × 306
12.	19 × 42	27 × 4286	491 × 723	840 × 917
13.	76 × 73	90 × 3805	245 × 180	457 × 581
14.	80 × 45	17 × 2935	570 × 649	506 × 537

1. You can make magic squares from other magic squares if you are careful to follow the rules. If you add or subtract the same number from *every number* in a magic square, you will get a new magic square. For example, if you add 10 to each number in square *A* below, you will get *B*. If you test *B*, you will find that it is also a magic square.

A

13	8	9
6	10	14
11	12	7

B

23	18	19
16	20	24
21	22	17

C

8	3	4
1	5	9
6	7	2

2. What number do you subtract from each number in *A* to get *C*? Is *C* a magic square?

3. Test squares *D*, *E*, and *F*. Is each a magic square? Make a new magic square by adding 8 to each number in *D*; by adding $\frac{1}{4}$ to each fraction in *E*; by adding $\frac{1}{5}$ to each fraction in *F*. Test your new squares.

D

11	19	6
7	12	17
18	5	13

E

$\frac{3}{8}$	$\frac{11}{16}$	$\frac{1}{4}$
$\frac{5}{16}$	$\frac{7}{16}$	$\frac{9}{16}$
$\frac{5}{8}$	$\frac{3}{16}$	$\frac{1}{2}$

F

$\frac{2}{5}$	$\frac{9}{10}$	$\frac{1}{5}$
$\frac{3}{10}$	$\frac{1}{2}$	$\frac{7}{10}$
$\frac{4}{5}$	$\frac{1}{10}$	$\frac{3}{5}$

4. Make new magic squares from *E* by adding $\frac{1}{16}$ to each fraction; by adding $\frac{3}{16}$ to each fraction; by subtracting $\frac{1}{8}$ from each fraction; by subtracting $\frac{1}{16}$ from each fraction. Test each new square.

5. Make a new magic square from *F* by adding $\frac{2}{5}$ to each fraction; by subtracting $\frac{1}{10}$ from each fraction.

When you subtract a number from the numbers in a magic square, the number subtracted must not be larger than the smallest number in the square.

Add up. Check the work by adding down:

1.

27	58	19	59	92	51	27	29
46	77	58	33	85	39	14	45
73	46	33	49	17	42	82	20
46	65	26	63	71	78	59	43
65	35	84	22	96	80	32	68
31	44	60	48	24	31	78	11
28	12	23	34	15	54	38	46

2.

$352.71	$283.00	$160.57	$288.40	$180.09
135.39	115.72	79.36	70.89	293.54
56.63	46.84	95.14	607.51	212.89
102.05	230.46	171.47	16.78	89.90
61.04	144.17	406.59	166.58	103.38

Multiply. Check by interchanging the numbers:

3. 720 × $4.85	635 × $1.38	392 × $6.50
4. 158 × $3.50	387 × $9.17	446 × $5.01
5. 196 × $7.24	602 × $5.69	381 × $4.62
6. 403 × $9.79	519 × $3.98	250 × $7.46
7. 274 × $6.23	748 × $8.46	179 × $1.98

Divide. Check the work by multiplying:

8. 5928 ÷ 52	37,200 ÷ 48	$261.12 ÷ 64
9. 1216 ÷ 19	21,876 ÷ 22	$269.99 ÷ 29
10. 8075 ÷ 25	30,704 ÷ 51	$158.44 ÷ 17
11. 7347 ÷ 93	17,902 ÷ 28	$144.90 ÷ 45
12. 8260 ÷ 59	13,005 ÷ 16	$195.82 ÷ 34
13. 9554 ÷ 31	28,634 ÷ 39	$359.70 ÷ 55
14. 2736 ÷ 18	23,808 ÷ 24	$105.28 ÷ 47
15. 3738 ÷ 42	16,798 ÷ 37	$162.75 ÷ 25

1. Betty uses $\frac{3}{4}$ cup of milk for each cup of cocoa. How many cups of milk does she need for 5 cups of cocoa?

To find the number of cups of milk Betty needs, you must find what $5 \times \frac{3}{4}$ equals. Since 5×3 fourths $= 15$ fourths, $5 \times \frac{3}{4} = \frac{15}{4}$. $\frac{15}{4} = 3\frac{3}{4}$. Betty needs $3\frac{3}{4}$ cups of milk.

$$5 \times \frac{3}{4} = \frac{5 \times 3}{4} = \frac{15}{4} = 3\frac{3}{4}$$

2. Jane says she uses $\frac{2}{3}$ cup of milk for each cup of cocoa. How many cups of milk does Jane need for 5 cups of cocoa?

3. Kate says she uses $\frac{1}{2}$ cup of milk for each cup of cocoa. How many cups of milk does Kate need for 5 cups of cocoa?

4. Study these exercises:

$6 \times \frac{3}{4} = \frac{18}{4} = 4\frac{1}{2}$ $\quad 9 \times \frac{2}{3} = \frac{18}{3} = 6$ $\quad 15 \times \frac{5}{6} = \frac{75}{6} = 12\frac{1}{2}$

> To multiply a fraction by a whole number, multiply the numerator by the whole number and divide the product by the denominator.

Multiply the following. Be sure the fraction in the answer is reduced to lowest terms:

5.	$7 \times \frac{1}{2}$	$9 \times \frac{3}{4}$	$7 \times \frac{1}{6}$	$7 \times \frac{2}{3}$	$4 \times \frac{1}{6}$
6.	$4 \times \frac{2}{3}$	$2 \times \frac{5}{6}$	$4 \times \frac{3}{5}$	$9 \times \frac{5}{6}$	$7 \times \frac{2}{5}$
7.	$6 \times \frac{1}{4}$	$8 \times \frac{1}{3}$	$9 \times \frac{1}{6}$	$5 \times \frac{1}{8}$	$3 \times \frac{3}{8}$
8.	$8 \times \frac{1}{5}$	$5 \times \frac{1}{4}$	$3 \times \frac{3}{4}$	$2 \times \frac{4}{5}$	$7 \times \frac{3}{4}$
9.	$5 \times \frac{1}{6}$	$7 \times \frac{3}{8}$	$5 \times \frac{1}{2}$	$6 \times \frac{7}{8}$	$6 \times \frac{2}{3}$
10.	$3 \times \frac{5}{8}$	$3 \times \frac{1}{2}$	$5 \times \frac{3}{4}$	$3 \times \frac{2}{5}$	$5 \times \frac{5}{6}$
11.	$2 \times \frac{3}{4}$	$4 \times \frac{2}{5}$	$8 \times \frac{2}{3}$	$4 \times \frac{3}{8}$	$8 \times \frac{3}{4}$
12.	$9 \times \frac{3}{5}$	$6 \times \frac{3}{4}$	$6 \times \frac{5}{8}$	$8 \times \frac{1}{6}$	$9 \times \frac{1}{2}$

Multiplying a fraction by a whole number.

1. Jim's father drives $14\frac{3}{4}$ mi. a day to his work and back. He works 6 days a week. How many miles does he drive to work and back in a week?

First multiply $\frac{3}{4}$ by 6, which gives $4\frac{1}{2}$. Then multiply 14 by 6. Place the products as shown at the right. Then add the products. Check by going over the work. Jim's father rides $88\frac{1}{2}$ mi. to work and back in a week.

$$\begin{array}{r} 14\frac{3}{4} \\ 6 \\ \hline 4\frac{1}{2} \\ 84 \\ \hline 88\frac{1}{2} \end{array}$$

2. Jim walks $1\frac{3}{4}$ mi. a day going to school and back. How many miles all together does Jim walk in 5 days going to school and back?

3. Study the examples below. In the first example the first partial product is 6; how was 6 obtained? In the last example the first partial product is $3\frac{1}{3}$; how was $3\frac{1}{3}$ obtained?

$$\begin{array}{r} 9\frac{3}{4} \\ 8 \\ \hline 6 \\ 72 \\ \hline 78 \end{array} \qquad \begin{array}{r} 14\frac{1}{2} \\ 2 \\ \hline 1 \\ 28 \\ \hline 29 \end{array} \qquad \begin{array}{r} 2\frac{1}{6} \\ 4 \\ \hline 8\frac{2}{3} \end{array} \qquad \begin{array}{r} 23\frac{3}{8} \\ 7 \\ \hline 2\frac{5}{8} \\ 161 \\ \hline 163\frac{5}{8} \end{array} \qquad \begin{array}{r} 35\frac{2}{3} \\ 5 \\ \hline 3\frac{1}{3} \\ 175 \\ \hline 178\frac{1}{3} \end{array}$$

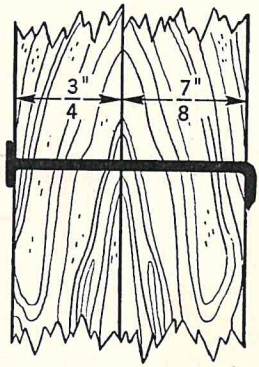
Multiply. Check the work by going over it:

4. $7 \times 5\frac{2}{3}$	$4 \times 9\frac{1}{5}$	$3 \times 16\frac{3}{4}$	$24 \times 17\frac{1}{2}$
5. $8 \times 3\frac{3}{4}$	$7 \times 4\frac{1}{6}$	$5 \times 23\frac{4}{5}$	$35 \times 23\frac{2}{5}$
6. $4 \times 6\frac{1}{2}$	$8 \times 2\frac{1}{3}$	$9 \times 17\frac{2}{3}$	$16 \times 75\frac{2}{3}$
7. $5 \times 2\frac{3}{8}$	$3 \times 6\frac{3}{4}$	$6 \times 38\frac{1}{6}$	$28 \times 19\frac{1}{4}$
8. $9 \times 4\frac{2}{3}$	$5 \times 3\frac{7}{8}$	$7 \times 25\frac{1}{2}$	$32 \times 64\frac{3}{8}$
9. $3 \times 8\frac{5}{8}$	$6 \times 5\frac{5}{6}$	$4 \times 19\frac{3}{8}$	$48 \times 17\frac{5}{6}$
10. $6 \times 9\frac{3}{5}$	$9 \times 3\frac{2}{3}$	$2 \times 56\frac{7}{8}$	$51 \times 27\frac{1}{3}$
11. $8 \times 4\frac{5}{8}$	$7 \times 2\frac{3}{4}$	$5 \times 16\frac{2}{3}$	$12 \times 19\frac{5}{6}$
12. $7 \times 2\frac{3}{5}$	$4 \times 3\frac{1}{6}$	$3 \times 24\frac{3}{4}$	$15 \times 24\frac{1}{6}$

Multiplying a mixed number by a whole number.

1. Nails come in many different sizes and are known as twopenny nails, threepenny nails, and so on. The size is written 2 d. for twopenny and 3 d. for threepenny. Today nails are often named by their length, as a $2\frac{1}{2}$-inch nail. A twopenny nail is 1 in. long, a threepenny nail is $1\frac{1}{4}$ in. long, and a fourpenny nail is $1\frac{1}{2}$ in. long. Each penny added, up to 10 d., means that each nail is $\frac{1}{4}$ in. longer than the one before it. Beginning with a twopenny nail, make a table showing the length of each nail from 2 d. to 10 d.

2. Suppose you want a nail to go through a $\frac{3}{4}$-inch board and a $\frac{7}{8}$-inch board and to have $\frac{3}{8}$ in. left to turn over, or clinch. How long a nail do you need to buy? What penny nail do you ask for?



3. How long should a nail be to go through a $1\frac{1}{2}$-inch board and a $\frac{3}{4}$-inch board and leave $\frac{1}{2}$ in. to clinch?

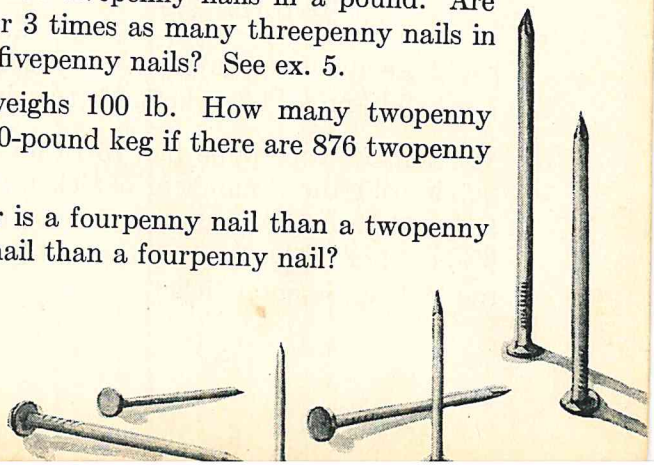
4. How long a nail do you need to go through two boards each $1\frac{1}{4}$ in. thick and have $\frac{1}{2}$ in. to clinch?

5. There are about 568 threepenny nails to a pound. Will 12 lb. or 13 lb. of these nails be needed for a job that requires 7300 nails of this size?

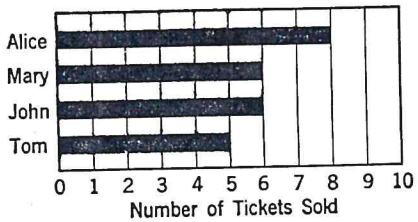
6. There are about 271 fivepenny nails in a pound. Are there about 2 times or 3 times as many threepenny nails in a pound as there are fivepenny nails? See ex. 5.

7. A keg of nails weighs 100 lb. How many twopenny nails are there in a 100-pound keg if there are 876 twopenny nails in a pound?

8. How much longer is a fourpenny nail than a twopenny nail? an eightpenny nail than a fourpenny nail?

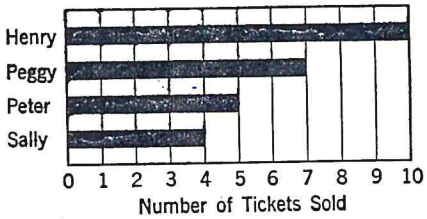


1. All the pupils in Centerville worked to sell tickets for the spring field day. Every member of Miss Clark's class had 10 tickets to sell. The first week Alice and Mary sold the most tickets for the girls in the class. John and Tom sold the most tickets for the boys. To show this, Miss Clark made a picture on the blackboard like the one at the right. This picture is a *bar graph.* It is used to compare the numbers of tickets sold by the four pupils. The graph quickly tells that Alice sold the most tickets the first week. The numbers across the bottom are called the *scale.* These numbers run from 0 to 10. Each space on the scale represents 1 ticket.



2. From the bar graph above tell how many tickets each one of the four pupils sold.

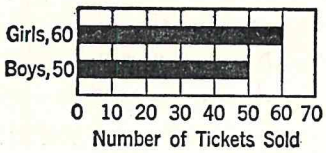
3. Miss White made a graph for her class like the one shown at the left. Who sold the most tickets the first week in Miss White's room? How many tickets did each one of the four pupils sell?



4. Make a bar graph like those above to show that in Miss King's room Jack sold 7 tickets, Ann sold 7 tickets, Betty sold 6, and Jim sold 5.

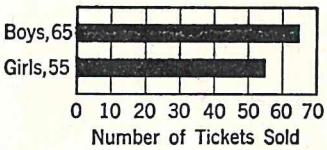
5. Suppose each pupil had 15 tickets to sell and that five pupils sold these numbers of tickets: George, 12 tickets; Helen, 10 tickets; Margaret, 9 tickets; Thomas, 9; William, 7. Make a bar graph to show these facts. Let each space on the scale represent 1 ticket.

1. Miss Clark made another graph to show the sales in her room for the first week. All the girls together sold 60 tickets and all the boys together sold 50 tickets. In the graph at the right, which Miss Clark made, you see that the numbers across the bottom, called the scale, run from 0 to 70.



Each space on the scale stands for 10 tickets. Since the girls sold 60 tickets, the bar for the girls is 6 spaces in length. How many spaces long is the bar for 50?

2. The first week in Miss White's room all the boys together sold 65 tickets and all the girls sold 55 tickets. On Miss White's graph, which is shown at the left, each space stands for 10 tickets, so a half space will stand for 5 tickets. To show 65, she made the bar $6\frac{1}{2}$ spaces long. You see that the end of the bar comes halfway between 60 and 70. Why? How did she draw the bar for 55? Tell where the bar would end on this graph if you wanted to show 45; if you wanted to show 35.



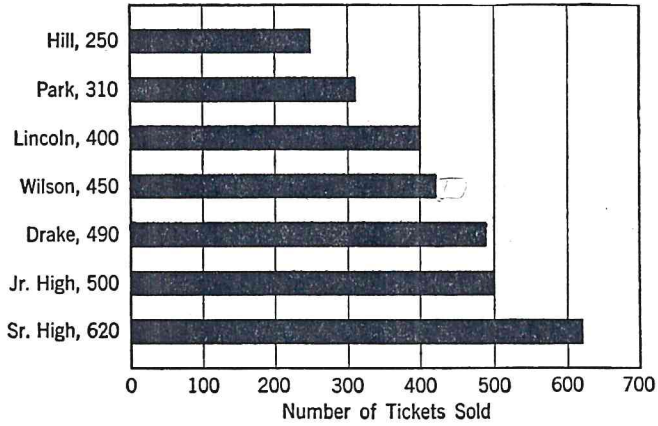
3. In Miss King's room the first week all the boys sold 50 tickets and all the girls sold 40 tickets. Make a bar graph to show these facts.

4. Suppose the boys in Miss King's room sold 52 tickets and the girls sold 47. Make a bar graph of these facts.

The bar for 52 will be a little over 5 spaces long but not as long as $5\frac{1}{2}$ spaces. How long will the bar for 47 be?

5. Draw bars to show these numbers of tickets: 20, 58, 65, 70, 73, 90. First draw the scale, letting each space stand for 10. Make each space on the scale $\frac{1}{4}$ in. wide.

1. Miss Clark had the figures showing the number of tickets sold by each of the seven schools in Centerville. She made the graph below to show how the seven schools compare in the ticket sale. You see that the bars in the graph are arranged in order beginning with the shortest one. How many tickets did each school sell?



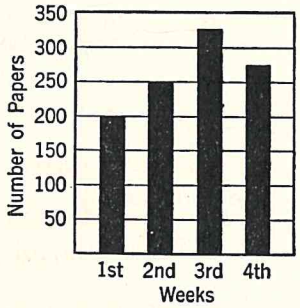
2. Each space in the graph above stands for 100 tickets. To show that the Hill School sold 250 tickets, Miss Clark drew the bar $2\frac{1}{2}$ spaces long. To show 310 tickets for the Park School, Miss Clark made the bar just a little longer than 3 spaces but not as long as $3\frac{1}{2}$ spaces. Study each of the other bars to see if it agrees in length with the number marked at the left end of the bar. One of the bars is not drawn the correct length. Which bar is it?

Draw bar graphs to show these facts. Let each space $= \frac{1}{2}$ in.:

3. Four boys have stamp collections. Bill has 800 stamps, Ned has 750, Henry has 500, and Dan has 490.

4. These are the numbers of pupils in six different schools: Lincoln, 450; Jefferson, 400; Knox, 390; Washington, 350; Wilson, 310; Park, 300.

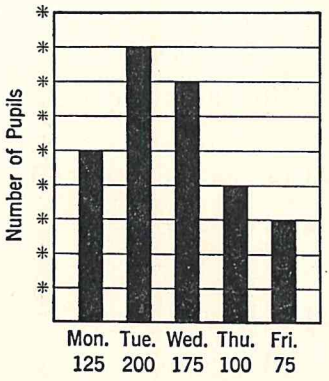
1. John made a bar graph like the one at the right to show the number of papers he sold each week for four weeks. When John made the graph, he forgot to write the number at the bottom of each bar that shows how many papers he sold; see the graph on page 218. Read John's graph and tell how many papers you think he sold each week.



2. Study the scale on the graph in ex. 1. What number does each space on the scale stand for? What number does half a space stand for? If the end of a bar comes halfway between 100 and 150, what number does it stand for? How would you draw a bar to show 175?

3. Make a bar graph like the one in ex. 1 to show that John sold these numbers of papers in the next four weeks: fifth week, 300 papers; sixth week, 275 papers; seventh week, 325 papers; eighth week, 350 papers.

4. Betty drew this bar graph to show the number of pupils that went to the city museum on each school day last week. When she drew the graph, she forgot to write the numbers on the vertical scale. Study the graph and tell the numbers to put in place of the stars.



5. Make a bar graph using these facts: Robert got 50 eggs on Monday, 45 eggs on Tuesday, 35 eggs on Wednesday, 50 eggs on Thursday, 48 eggs on Friday, 41 eggs on Saturday, and 40 eggs on Sunday. On the scale of your graph, will each space stand for 10 or for 50?

Add and check the work:

1.

244	587	499	739	128	717	136
587	442	232	615	503	178	248
306	264	467	396	278	509	883
174	267	105	533	925	756	430
315	843	398	151	466	200	489
343	516	442	327	265	740	269

Divide and check the work:

2. $24\overline{)1560}$ $39\overline{)1599}$ $70\overline{)36263}$ $18\overline{)10314}$ $58\overline{)47930}$

3. $19\overline{)1090}$ $28\overline{)2700}$ $43\overline{)37066}$ $32\overline{)13696}$ $67\overline{)20636}$

4. $35\overline{)1610}$ $61\overline{)2867}$ $59\overline{)38189}$ $44\overline{)33328}$ $31\overline{)10073}$

5. $24\overline{)1800}$ $29\overline{)8468}$ $17\overline{)13005}$ $33\overline{)11979}$ $16\overline{)13696}$

6. Find the sum of $2\frac{5}{8}$, $3\frac{1}{4}$, and $1\frac{5}{16}$.

7. How many ounces are there in $5\frac{3}{4}$ lb.?

8. Using the numbers 5 and 8, write a proper fraction; an improper fraction.

9. Find the average of 386, 295, 341, 402, 366.

10. Write each of these numbers in Roman numerals: 54, 86, 93, 165, 741, 1912, 1920, 1950.

11. Write a fraction equal to $\frac{3}{4}$ with a denominator of 16.

12. Which of these fractions is larger, $\frac{7}{12}$ or $\frac{2}{3}$?

13. Change $\frac{35}{8}$ to a mixed number.

14. What is the difference between $11\frac{5}{8}$ and $9\frac{1}{4}$?

15. How many dozen eggs are there in 300 eggs?

16. If you take 209 from 700, what is the remainder?

17. Find the cost of $3\frac{3}{4}$ yd. of silk at \$1.69 a yard.

1. Mary wants to make curtains for the kitchen. She needs $1\frac{7}{8}$ yd. for each window. How many yards of curtain material will she need to buy for 3 windows?

2. Jane bought $8\frac{1}{2}$ yd. of ribbon at 25¢ a yard and 4 yd. of lace at 35¢ a yard. How much did these things cost?

3. Bill and his father went fishing. They caught 3 fish weighing $4\frac{1}{2}$ lb., $3\frac{1}{4}$ lb., and $2\frac{5}{8}$ lb. How many pounds of fish did they have all together?

4. Helen's mother bought a piece of lace 7 yd. long. She used $3\frac{7}{8}$ yd. on a dress for herself and $2\frac{1}{4}$ yd. on a dress for Helen. How much lace did she have left?

5. Tom went to the butcher for his mother. He asked for $\frac{3}{4}$ lb. of chopped beef. How much did he pay for it at 45¢ a pound?

6. Mr. Allen's car averages 18 mi. on each gallon of gasoline. How many gallons does he need for a trip of 500 mi.? Give your answer to the nearest whole gallon.

7. George has a set of 15 reference books that cost $69.50. At that price, how much did each book cost? Should you keep the fraction in the answer? Why?

8. Mrs. Brown's monthly telephone bills for the last 6 months were $4.50, $3.75, $5.30, $4.30, $3.90, and $4.05. What was her average monthly bill?

9. Tom and his 2 brothers are going to a basketball game. Tom paid $.45 for each ticket. How much change did he get from $2.00?

10. Henry got 115 eggs last week. He sold 7 doz. to the neighbors and 2 doz. to his mother. How many eggs did he have left?

11. Ann made $5\frac{1}{8}$ lb. of chocolate fudge and $3\frac{1}{4}$ lb. of maple fudge. She mixed the candy and sold it in boxes each holding 1 lb. Did she have any candy left?

1. The 25 members of the Bird Club are planning a trip to Rock Park some Saturday in April. They have made a list of expenses for the day's trip and find it will cost $24.75 in all. If the 25 members share the expense, how much should each one pay?

You must divide $24.75 by 25.

Since 24 is less than the divisor 25, you must use 247 as the first partial dividend. To divide 247 by 25, think "How many 2's are there in 24?" You know there are 12, but 12 cannot be the first quotient figure because 9 is the largest quotient figure you can have. Try 9 as the quotient. Multiply 25 by 9, which gives 225. Subtract 225 from 247, which leaves 22. Is 9 the correct figure? Tell how the second quotient figure is found. The answer is 99. Each member of the Bird Club should pay $.99 for the trip.

```
   $  .99
25)$24.75
   22 5
    2 25
    2 25
```

2. Divide 4005 by 45.

To divide 400 by 45, think "How many 4's are there in 40?" You know there are 10, but you cannot use a quotient figure larger than 9. Try 9 as the quotient figure and multiply 45 by 9. You see that 9 is too large because $9 \times 45 = 405$ and you cannot subtract 405 from 400. Then try 8. Tell why 8 is right. Show how the work is finished.

```
     89
45)4005
   360
    405
    405
```

3. In each example tell how the quotient figures are found:

```
     99        89        88        96
34)3366   24)2136   23)2024   35)3360
   306       192       184       315
    306       216       184       210
    306       216       184       210
```

To the Teacher: Cases like those above where the trial quotient figure is 10, 11, or 12 occur infrequently with divisors ending in 1 to 5; they never occur with divisors ending in 6 to 9 if the rule on page 139 is followed.

Divide and check the work:

1.	45)400	24)2112	23)2001	34)30045	25)23775
2.	22)207	34)3264	33)3280	23)20417	22)21683
3.	25)200	35)2415	24)2352	35)31246	35)34825
4.	34)300	21)2037	45)4410	25)20844	21)20247
5.	24)221	43)4042	23)2162	25)24613	45)43718
6.	25)222	23)2254	35)3395	45)44854	53)51398

WHICH IS THE RIGHT ANSWER?

One of the numbers after the problem is the answer. Which one is it?

7. A train makes the trip from Newton to Plainfield in 17 hr. The distance is 816 mi. What is the average speed of the train per hour? (50 mi.; 49 mi.; 48 mi.)

8. The baseball team of Park School needs new suits. They will buy 15 suits for the team and extra players. If each suit costs $5.95, find the cost of all the suits. ($90.00; $89.25; $892.50.)

9. Last week Tom's father got 511 eggs from his hens. He sold all but 19 eggs by the dozen. How much did he get at a price of $.48 a dozen? ($19.68; $18.68; $20.68.)

10. Dick has 2 half dollars, 8 quarters, 5 dimes, 11 nickels, and 17 pennies in his bank. How much money is this in all? ($4.22; $3.62; $4.20.)

11. Betty went to the movies at 1:40. The show was over at 4:25. How long was the show? (3 hr. 15 min.; 2 hr. 15 min.; 2 hr. 45 min.)

REDUCING FRACTIONS IN QUOTIENTS

1. Jack helps his neighbor, Mrs. Green, after school and on Saturdays. Last week Jack worked a total of 270 min. How many hours did he work?

You see that $270 \div 60 = 4$ with a remainder of 30. This means that Jack worked 4 hr. and 30 min. 30 min. is $\frac{30}{60}$ or $\frac{1}{2}$ of an hour, so Jack worked $4\frac{1}{2}$ hr. last week.

$$\begin{array}{r} 4\frac{30}{60} = 4\frac{1}{2} \\ 60\overline{)270} \\ \underline{240} \\ 30 \end{array}$$

2. Study these examples:

$$\begin{array}{r} A.\quad 15\frac{10}{12} = 15\frac{5}{6} \\ 12\overline{)190} \\ \underline{12} \\ 70 \\ \underline{60} \\ 10 \end{array} \qquad \begin{array}{r} B.\quad 21\frac{9}{36} = 21\frac{1}{4} \\ 36\overline{)765} \\ \underline{72} \\ 45 \\ \underline{36} \\ 9 \end{array} \qquad \begin{array}{r} C.\quad 32\frac{24}{54} = 32\frac{4}{9} \\ 54\overline{)1752} \\ \underline{162} \\ 132 \\ \underline{108} \\ 24 \end{array}$$

$$\frac{10}{12} = \frac{5}{6} \qquad \frac{9}{36} = \frac{3}{12} = \frac{1}{4} \qquad \frac{24}{54} = \frac{8}{18} = \frac{4}{9}$$

3. In example *A* above, by what number were both terms of $\frac{10}{12}$ divided to reduce $\frac{10}{12}$ to lowest terms?

4. In example *B* above, by what number were both terms of $\frac{9}{36}$ divided to reduce $\frac{9}{36}$ to $\frac{3}{12}$? How was $\frac{3}{12}$ reduced to $\frac{1}{4}$? If both terms of $\frac{9}{36}$ are divided by 9, the fraction $\frac{9}{36}$ can be reduced to lowest terms in one step.

5. In example *C* above, $\frac{24}{54}$ was reduced to lowest terms in two steps. How can you do it in one step?

These fractions may occur in problems in long division. Reduce them to lowest terms:

1. $\frac{16}{24}$ $\frac{42}{58}$ $\frac{26}{42}$ $\frac{49}{63}$ $\frac{36}{54}$ $\frac{24}{72}$ $\frac{22}{30}$ $\frac{32}{56}$
2. $\frac{50}{70}$ $\frac{15}{40}$ $\frac{28}{52}$ $\frac{38}{74}$ $\frac{44}{77}$ $\frac{52}{68}$ $\frac{21}{45}$ $\frac{64}{72}$

Divide. Reduce fractions in quotients to lowest terms, if possible:

3. $25\overline{)805}$ $36\overline{)1560}$ $78\overline{)5942}$ $27\overline{)1332}$ $42\overline{)2667}$

4. $34\overline{)792}$ $28\overline{)1756}$ $45\overline{)2455}$ $67\overline{)5775}$ $31\overline{)1682}$

5. $46\overline{)656}$ $87\overline{)6279}$ $32\overline{)2056}$ $13\overline{)1239}$ $16\overline{)1380}$

6. $43\overline{)999}$ $55\overline{)2550}$ $18\overline{)1374}$ $24\overline{)1740}$ $45\overline{)2120}$

7. $28\overline{)604}$ $21\overline{)1578}$ $29\overline{)2360}$ $35\overline{)1862}$ $59\overline{)5165}$

In each problem express the remainder as a fraction in the quotient:

8. Jack's hens laid 186 eggs last week. How many dozen eggs was that?

9. Jack sold 8 hens yesterday to a neighbor. Their total weight was 38 lb. What was the average weight per hen?

10. Alice practiced 40 min. on Monday, 70 min. on Tuesday, 65 min. on Wednesday, 35 min. on Thursday, 50 min. on Friday. How many hours did Alice practice in all?

11. Betty has measured the windows in her room for curtains. She needs 2 curtains each 72 in. long for one window and 2 curtains each 54 in. long for the other window. How many yards of curtain material does Betty need if she allows 6 in. extra on each curtain for hems?

12. An airplane flew a distance of 747 mi. in 6 hr. Find the average speed of the plane in miles per hour.

1. Name the months of the year. Name one month that has 31 days, one that has 30 days, and one that has 28 days.

2. How many days are there in February in a leap year?

3. How many days are there in a leap year? Name the next two leap years.

4. How many years are there in a decade? in a century? Can you tell in which century you are living?

5. Can you name a measure that is found in two different tables of measure?

6. What part of a yard is 24 in.? 27 in.? 12 in.? 18 in.?

7. What part of an hour is 15 min.? 20 min.? 30 min.? 40 min.? 45 min.? 50 min.?

8. How many quarts are there in 1 bu.? in 4 bu.? in $\frac{1}{2}$ bu.? in $\frac{3}{4}$ bu.?

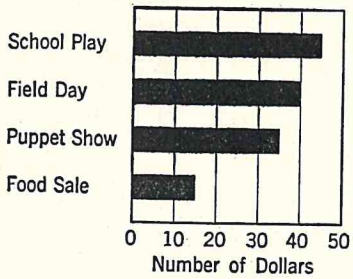
9. What part of a gallon is 1 qt.? What part of a bushel is 16 qt.? 12 qt.? 24 qt.?

10. Which kind of candy gives more weight for the same money, 2 five-cent candy bars that weigh 2 oz. each, or 1 ten-cent cake of chocolate that weighs 3 oz.?

Tell the number that goes in each space:

11.	$1\frac{1}{4}$ hr. = .. min.	6 mo. = .. yr.	18 ft. = .. yd.
12.	$2\frac{3}{4}$ lb. = .. oz.	$\frac{3}{4}$ yd. = .. in.	20 pk. = .. bu.
13.	90 min. = .. hr.	9 in. = .. yd.	12 qt. = .. pk.
14.	30 sec. = .. min.	9 in. = .. ft.	$2\frac{1}{4}$ T. = .. lb.
15.	15 qt. = .. gal.	$\frac{1}{2}$ mi. = .. ft.	$5\frac{1}{2}$ qt. = .. pt.
16.	10 pk. = .. qt.	8 pk. = .. bu.	20 oz. = .. lb.
17.	12 oz. = .. lb.	8 pt. = .. gal.	9 gal. = .. pt.
18.	16 qt. = .. bu.	4 pt. = .. gal.	$1\frac{3}{4}$ lb. = .. oz.
19.	12 hr. = .. da.	2 bu. = .. qt.	27 in. = .. yd.

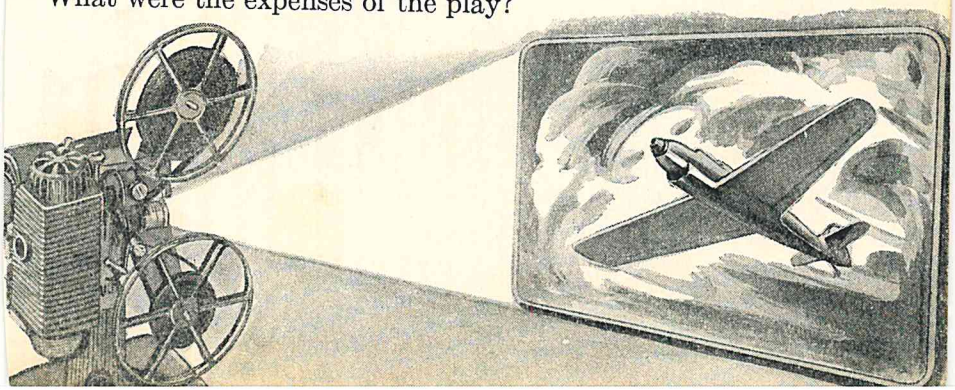
1. The pupils in the Knox School have been working since last fall to earn money to buy a movie projector and screen for the school. At the end of March, Miss Wilson made the graph at the right to show how much the pupils have earned in each of four ways. In this graph the numbers on the scale stand for dollars. How much money did the pupils earn in each way? Which bar shows the largest amount earned? Which bar shows the smallest amount earned? Does the graph show how much the pupils earned all together? How much in all did they earn?



2. The movie projector will cost $125.50 and the screen will cost $12.50. Have the pupils earned enough money to pay for both things? If not, how much more do they need?

3. In addition to the $3.00 needed to make a total of $138.00 to pay for the projector and screen, the pupils want to earn still more money to buy reels of pictures. They can get a reel of travel pictures for $3.49, a reel of animal pictures for $2.98, and a reel of "Donald Duck" for $2.50. How much more money in all does the class need?

4. The tickets for the school play were $.25 each and 275 of them were sold. After paying the expenses of the play, they had $45.00 left which was used toward the projector and screen. This $45.00 is shown above in the graph. What were the expenses of the play?



1. On Saturday Robert had walked $1\frac{1}{4}$ mi. up the road from his house when Mr. Smith gave him a ride to town. The distance from Robert's house to town is $3\frac{1}{2}$ mi. How many miles did Robert ride with Mr. Smith?

2. Mr. Smith lives on a farm $1\frac{1}{8}$ mi. farther away from town than Robert. How far is it from Mr. Smith's farm to town? See ex. 1.

3. Mr. Smith drives to town and back on an average of 10 times a week. How many miles in all does he travel on these trips?

Add. Check the work by going over it:

4.

$6\frac{1}{2}$	$4\frac{9}{10}$	$3\frac{3}{16}$	$2\frac{3}{4}$	$4\frac{1}{5}$	$10\frac{5}{16}$
$1\frac{3}{4}$	$2\frac{2}{5}$	$7\frac{1}{2}$	$2\frac{1}{2}$	$\frac{1}{2}$	$18\frac{7}{16}$
$8\frac{1}{8}$	$5\frac{1}{2}$	$1\frac{3}{8}$	$2\frac{1}{12}$	$9\frac{2}{5}$	$12\frac{11}{16}$

Subtract. Check the work by going over it:

5.

1	$5\frac{1}{2}$	$6\frac{5}{6}$	$9\frac{1}{5}$	$3\frac{7}{8}$	$12\frac{2}{3}$
$\frac{3}{10}$	$2\frac{1}{4}$	$6\frac{2}{3}$	$1\frac{1}{2}$	$2\frac{1}{8}$	$5\frac{1}{2}$

6.

6	$4\frac{1}{4}$	$8\frac{1}{3}$	$7\frac{1}{10}$	$6\frac{9}{16}$	$15\frac{7}{12}$
$4\frac{7}{12}$	$3\frac{3}{4}$	$4\frac{1}{4}$	$5\frac{1}{2}$	$4\frac{7}{8}$	$14\frac{3}{4}$

Are there any mistakes in the exercises below? If so, work them correctly:

7.

$$\begin{array}{rcl} 5\frac{1}{2} & = & 5\frac{4}{8} \\ +\ 3\frac{3}{8} & = & 3\frac{3}{8} \\ \hline & & 8\frac{7}{8} \end{array} \qquad \begin{array}{rcl} 18\frac{5}{6} & = & 18\frac{5}{6} \\ +\ 2\frac{2}{3} & = & 2\frac{4}{6} \\ \hline & & 20\frac{9}{6} = 21\frac{2}{3} \end{array}$$

8.

$$\begin{array}{rcl} 7\frac{1}{8} & = & 6\frac{8}{8} \\ -\ 4\frac{3}{8} & = & 4\frac{3}{8} \\ \hline & & 2\frac{5}{8} \end{array} \qquad \begin{array}{rcl} 14\frac{1}{2} & = & 14\frac{5}{10} = 13\frac{15}{10} \\ -\ 6\frac{9}{10} & = & 6\frac{9}{10} = 6\frac{9}{10} \\ \hline & & 7\frac{6}{10} = 7\frac{3}{5} \end{array}$$

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1. 4175	9328	8776	9392	3228
2505	2846	7687	1636	8014
4244	5394	2545	2406	4690
1933	2633	4756	7470	1096
6469	4505	3326	6169	1413

Subtraction Test

Subtract. Write the answers on folded paper: Time: 4 min.

2. 97332	44928	50000	38414
37355	26548	12068	23417
3. 11694	68318	65294	20000
3549	45749	17618	18544
4. 82019	22910	10000	75500
53264	15920	7275	38905

Multiplication Test

Copy and multiply: Time: 5 min. after copying.*

5. 476	829	201	735	583	746
384	267	159	618	435	729

Division Test

Copy and divide: Time: 8 min. after copying.*

6. 25)8059	34)17680	47)44744	18)15487
7. 19)7657	36)20802	33)26994	39)23712

* In the multiplication and division tests, copy all the exercises on a sheet of paper before taking the test. In copying, spread the exercises over the sheet to allow space for the work. See page 308.

In ex. 1–4 add 6 to each number. Add 8; add 7:

1.	25	38	72	16	49	93	57	64
2.	94	65	58	39	73	17	50	26
3.	18	51	83	27	69	74	42	35
4.	59	43	75	66	52	28	37	14

5. Read these Roman numbers:
XC CD LXIV MDXC MCM MCMXLII

6. Tell how to write these numbers as Roman numbers:
24 39 46 210 1500 1945

7. Betty bought $\frac{1}{4}$ lb. of salted peanuts. How many ounces of peanuts did she get?

8. Jane's mother needs 9 in. of cloth to make a collar and cuffs for Jane's dress. What part of a yard of cloth should she buy?

9. Alice practiced her piano lesson from 4:50 P.M. until 5:25 P.M. How many minutes did Alice practice?

10. How much will $\frac{3}{4}$ yd. of ribbon cost at 20¢ a yard?

11. How much will $1\frac{1}{2}$ yd. of ribbon cost at 20¢ a yard?

12. Sally used $\frac{3}{4}$ yd. of cloth from a piece that was 2 yd. long. How much cloth was left?

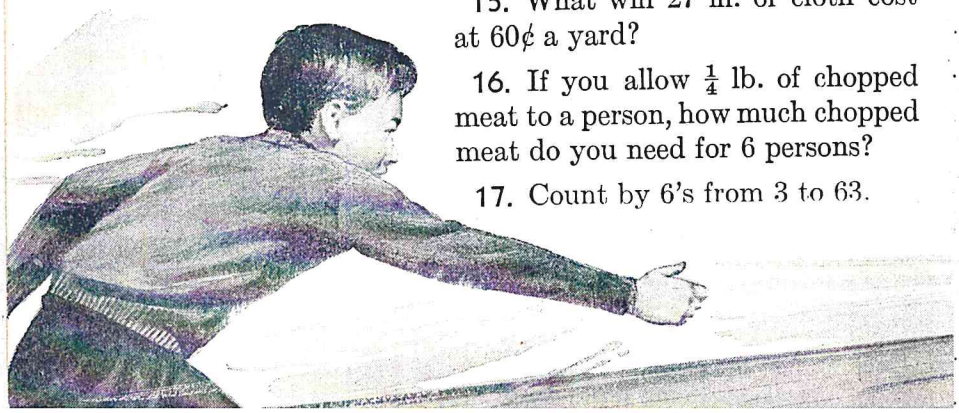
13. What is the average of 5, 8, 6, and 5?

14. How many eggs are there in $\frac{3}{4}$ dozen?

15. What will 27 in. of cloth cost at 60¢ a yard?

16. If you allow $\frac{1}{4}$ lb. of chopped meat to a person, how much chopped meat do you need for 6 persons?

17. Count by 6's from 3 to 63.



1. Betty promised to work 6 hr. after school this week helping to make costumes for a play. So far she has worked $\frac{3}{4}$ hr., $1\frac{1}{2}$ hr., $1\frac{3}{4}$ hr., and $1\frac{1}{4}$ hr. How many more hours does she need to work to make 6 hr.?

2. How many 4-ounce bags of candy can be filled from $8\frac{1}{2}$ lb. of candy? First change $8\frac{1}{2}$ lb. to ounces.

3. Mr. Bird averages about 35 mi. an hour in his car. About how many hours will it take him to drive 600 mi.?

4. A class of 33 pupils is planning to make scrapbooks of 96 pages each. How many sheets of paper are needed for all 33 books? 1 sheet of paper makes 2 pages.

5. How much change will Grace get from \$1.00 if she buys $\frac{3}{4}$ yd. of ribbon at \$.65 a yard?

6. Before the ball game Tom bought 8 lb. of peanuts at 25¢ a pound and some small paper bags for 15¢. He filled 32 bags with peanuts and sold them at 10¢ each. How much did Tom make on the peanuts?

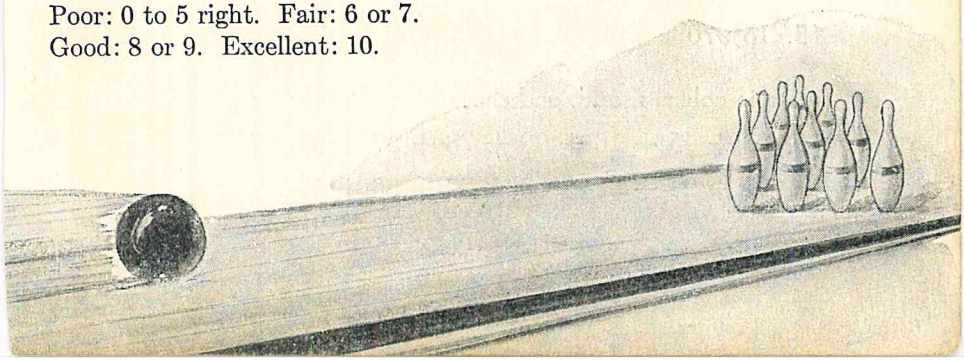
7. Alice needs $3\frac{3}{4}$ yd. of cheesecloth for a fairy costume. Her mother has a piece $2\frac{7}{8}$ yd. long. How much too short is this piece?

8. Jim helped his father sell 180 roses at \$1.75 a dozen. How much did they get for all the roses?

9. Three boys bought an old boat for \$11.50. They paid \$2.45 extra for repairs and \$1.95 for paint. If the 3 boys shared the total cost equally, how much did each boy pay?

10. At \$1.50 a yard, how much will 24 in. of lace cost?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Find the cost of $\frac{3}{4}$ lb. of candy at 36¢ a pound.

2. What is the cost of $\frac{3}{8}$ yd. of cloth at 25¢ a yard?

3. Mrs. Smith bought $2\frac{3}{4}$ lb. of meat at 50¢ a pound. How much did she pay for the meat?

4. How many yards of cloth do you need for 2 dresses if each dress takes $2\frac{3}{4}$ yd.?

5. If you use $\frac{7}{8}$ yd. of material for one towel, how many yards will you need for 6 towels?

6. Tom worked $5\frac{3}{4}$ hr. last week. How much did he earn at 35¢ an hour?

7. Mrs. Brown bought 2 fish. One fish weighed $1\frac{3}{4}$ lb. and the other weighed $1\frac{7}{8}$ lb. How much did the fish cost at 19¢ a pound?

8. Mary bought $3\frac{1}{2}$ doz. rolls. How many rolls is that?

Multiply and check the work:

9.	$3 \times \frac{3}{5}$	$5 \times \frac{1}{6}$	$6 \times 32\frac{2}{3}$	$\frac{2}{3} \times 22$	$\frac{3}{4} \times \$1.72$
10.	$4 \times \frac{5}{8}$	$4\frac{2}{3} \times 25$	$7 \times 15\frac{3}{8}$	$4\frac{1}{6} \times 65$	$\frac{3}{8} \times \$2.15$
11.	$\frac{3}{8} \times 17$	$5\frac{1}{4} \times 30$	$9 \times 21\frac{5}{6}$	$\frac{3}{5} \times 45$	$6\frac{1}{2} \times \$1.30$
12.	$\frac{3}{4} \times 56$	$6\frac{1}{2} \times 49$	$8 \times 16\frac{5}{8}$	$3\frac{1}{2} \times 46$	$4\frac{2}{3} \times \$1.80$

Divide. Write a remainder as a fraction in the quotient:

13.	$27\overline{)954}$	$44\overline{)2952}$	$38\overline{)1876}$	$72\overline{)7644}$	$17\overline{)15436}$
14.	$18\overline{)966}$	$65\overline{)1175}$	$16\overline{)3924}$	$53\overline{)4349}$	$28\overline{)21287}$
15.	$15\overline{)970}$	$39\overline{)2933}$	$83\overline{)3071}$	$35\overline{)2350}$	$46\overline{)24720}$

Write in columns, add, and check:

16. $28 + 45 + 16 + 90 + 78 + 57 + 39$

17. $49 + 24 + 33 + 65 + 77 + 86 + 58$

If you miss more than one example in any row, turn to the Practice Page for that row.

Find the answers. If the result stands for money, count a fraction of a cent as another cent. Keep fractions in other answers:

				PRACTICE PAGES
1.	$\frac{3}{4}$ of 48	$\frac{5}{8}$ of 120	$\frac{3}{5}$ of \$1.00	199
2.	$\frac{3}{8} \times 96$	$\frac{3}{4} \times 180$	$\frac{2}{3} \times \$2.34$	201
3.	$2\frac{3}{4} \times 76$	$1\frac{3}{8} \times 144$	$4\frac{3}{5} \times \$5.00$	202
4.	$\frac{2}{3}$ of 17	$\frac{5}{6}$ of \$.25	$\frac{3}{4} \times \$1.85$	203
5.	$1\frac{5}{8} \times 11$	$2\frac{1}{4} \times \$.39$	$6\frac{3}{8} \times \$1.49$	206
6.	$8 \times \frac{3}{5}$	$12 \times \frac{7}{8}$	$17 \times \frac{2}{3}$	213
7.	$5 \times 2\frac{2}{3}$	$9 \times 11\frac{3}{8}$	$28 \times 12\frac{1}{3}$	214
8.	$6 \times 4\frac{1}{2}$	$8 \times 12\frac{1}{4}$	$15 \times 33\frac{1}{3}$	214

Reduce each fraction to lowest terms:

9.	$\frac{35}{65}$	$\frac{24}{68}$	$\frac{36}{72}$	$\frac{18}{33}$	$\frac{27}{72}$	$\frac{25}{80}$	225

Divide. In ex. 10 and 11 write R before remainders. In ex. 12 to 14 write a remainder as a fraction in the quotient:

10.	$25\overline{)2331}$	$32\overline{)3136}$	$24\overline{)23856}$	223
11.	$34\overline{)3026}$	$23\overline{)2040}$	$45\overline{)40001}$	223
12.	$28\overline{)5385}$	$30\overline{)8071}$	$42\overline{)19385}$	225
13.	$36\overline{)2286}$	$45\overline{)5579}$	$32\overline{)26408}$	225
14.	$24\overline{)3016}$	$72\overline{)8919}$	$16\overline{)15788}$	225

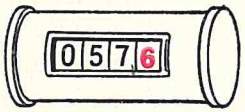
Diagnostic test.

CHAPTER SEVEN

Decimals and Scale Drawing

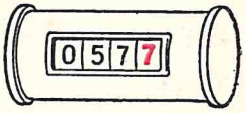
THE BICYCLE CLUB

1. Many boys and girls in Bayville belong to the Bicycle Club. Each pleasant Saturday during the spring they take trips around the country. Jim has a cyclometer on his bicycle which tells how far he rides. A picture of a cyclometer is given at the right. The number on the cyclometer shows that Jim has ridden $57\frac{6}{10}$ mi. The red 6 in the number stands for 6 *tenths* of a mile, while the 57 stands for 57 whole miles. The red figure 6 is a short way to show $\frac{6}{10}$ without writing the denominator 10.



2. Another way to write $57\frac{6}{10}$ is 57.6; the period before the 6 is called a *decimal point* and means that the first figure that follows it stands for *tenths*. For example, .6 means $\frac{6}{10}$ and .3 means $\frac{3}{10}$. You see that .6 is a new way of writing the fraction $\frac{6}{10}$ *without* writing the denominator 10.

3. Look again at Jim's cyclometer in ex. 1. It shows that he has ridden $57\frac{6}{10}$ mi. When he rides another $\frac{1}{10}$ mi. the red 6 will change to 7 as shown here. This means that he has now ridden 57.7 mi. Each time he rides another $\frac{1}{10}$ mi., the number will change as follows: 57.8, 57.9, 58.0, 58.1, and so on.



4. A number like .8 is called a *decimal fraction*, or a *decimal*. A number like $\frac{8}{10}$ is a *common fraction*.

1. You know that 57.6 is a short way to write $57\frac{6}{10}$. In the same way, 14.27 is a short way to write $14\frac{27}{100}$. When a decimal point is placed before the last two figures of a number, these two figures stand for *hundredths*. For example, 4.16 means $4\frac{16}{100}$, 2.08 means $2\frac{8}{100}$, and .17 means $\frac{17}{100}$.

2. You are using decimals when you write dollars and cents. For example, \$3.64 means $\$3\frac{64}{100}$. Since there are 100¢ in a dollar, $\frac{1}{100}$ of a dollar means 1¢, or \$.01, and $\frac{64}{100}$ of a dollar means 64¢, or \$.64.

3. Here are some more examples of decimals:

.8 ft. is a short way of writing $\frac{8}{10}$ ft.
.26 lb. is a short way of writing $\frac{26}{100}$ lb.
\$.38 is a short way of writing $\$\frac{38}{100}$.
.07 sec. is a short way of writing $\frac{7}{100}$ sec.
1.5 ft. is a short way of writing $1\frac{5}{10}$ ft.
9.32 in. is a short way of writing $9\frac{32}{100}$ in.

4. A number like 9.32, which is made up of a whole number and a decimal, is a *mixed decimal*, just as $9\frac{32}{100}$ is a mixed number. The number 9.32 is read "9 *and* 32 hundredths"; the decimal point is read "and." In business and science 9.32 is sometimes read "nine point three two."

5. Sometimes .8 is written 0.8, the zero being put before the decimal point to make sure that the decimal point is not overlooked. Each year in industry and business decimal fractions are being more widely used while common fractions are being less frequently used.

Read these numbers:

6.	.9	0.6	2.7	.32	0.46	6.38	\$ .06
7.	.2	0.8	9.8	.41	0.89	4.57	\$2.14
8.	.7	0.4	3.6	.78	0.52	9.08	\$4.50
9.	.5	0.7	4.3	.94	0.66	4.35	\$1.75

1. In a whole number like 365, 5 is in *ones* place, 6 is in *tens* place, and 3 is in *hundreds* place. In the same way, each place in a decimal has a name; for example, in the decimal .48, 4 is in *tenths* place and 8 is in *hundredths* place.

2. The names of the places of a number are shown below:

Thousands	Hundreds	Tens	Ones	Decimal point	Tenths	Hundredths
4	5	8	2	.	7	3

The number above is read "four thousand five hundred eighty-two and seventy-three hundredths." In reading a decimal like .73, give it the name of the place occupied by its right-hand figure. For example, .73 is read "73 hundredths" because 3 is in hundredths place.

Read each of these numbers:

3.	2.3 ft.	.65 ft.	0.62	0.9	26.4	1.06
4.	4.5 mi.	.09 in.	7.28	0.3	93.4	3.20

Write each number as a decimal or a mixed decimal:

5.	$\frac{3}{10}$	$\frac{65}{100}$	$\frac{40}{100}$	$6\frac{3}{100}$	$12\frac{5}{10}$	$8\frac{65}{100}$
6.	$\frac{15}{100}$	$\frac{7}{100}$	$\frac{9}{100}$	$4\frac{2}{10}$	$28\frac{44}{100}$	$3\frac{8}{100}$

Write each number as a common fraction or a mixed number:

7.	.6	.16	20.4	3.25	8.06	12.4
8.	.4	.24	13.5	4.19	2.30	9.65

Write these numbers in figures:

9. Two hundred ninety and six tenths.
10. Three hundred eighteen and thirty-five hundredths.
11. Eight hundred seventy-five and eight hundredths.

Place value.

1. Last week Jim rode his bicycle 6.5 mi. on Monday, 10.3 mi. on Wednesday, and 8.4 mi. on Thursday. How many miles did he ride in the three days?

To add the numbers, write them with the decimal points directly under one another and place a decimal point in the answer under the other decimal points. Jim rode his bicycle 25.2 mi. in the three days.

$$\begin{array}{r} 6.5 \\ 10.3 \\ 8.4 \\ \hline 25.2 \end{array}$$

2. Ann has a cyclometer on her new bicycle. The first week she rode 8.0 mi. and the next week she rode 6.3 mi. How many more miles did she ride the first week than the second? What does 8.0 mi. mean?

To subtract decimals, write the numbers with the decimal points under each other. The decimal point in the answer is placed under the other decimal points. Ann rode 1.7 mi. farther the first week than the second week.

$$\begin{array}{r} 8.0 \\ 6.3 \\ \hline 1.7 \end{array}$$

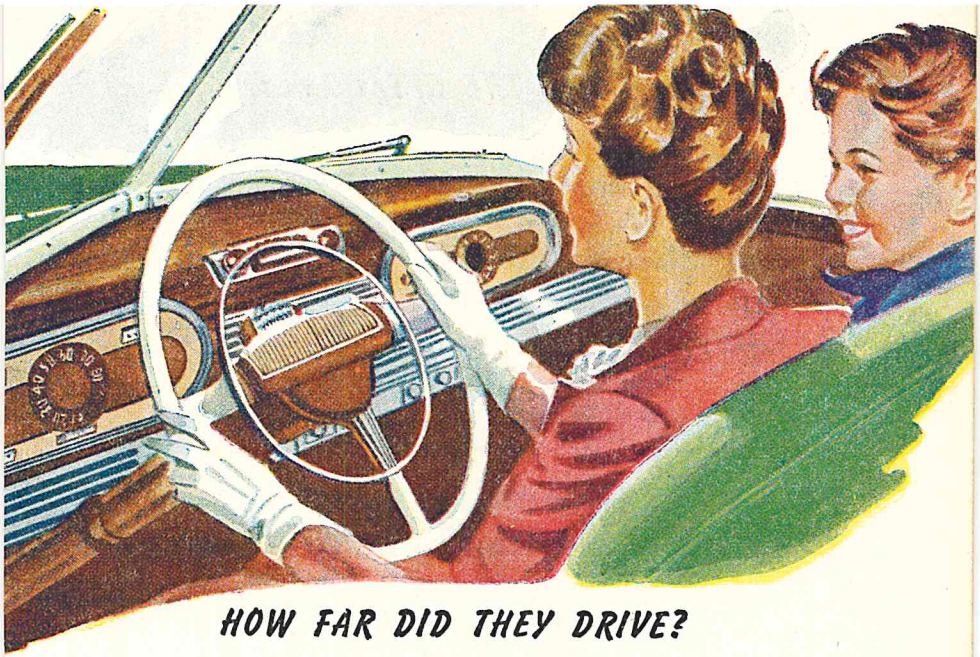
8.0 mi. means just 8 mi. Since the cyclometer measures to *tenths* of a mile, 8.0 shows that the distance is 8 mi. and *no* tenths just as $8.00 shows that the amount is 8 dollars and *no* cents.

Add these numbers and check the work:

3.	4.6	8.0	71.3	25.8	40.0	138.2
	2.2	7.5	50.0	11.9	39.1	125.6
4.	7.2	5.5	80.0	10.3	75.2	732.8
	4.8	3.9	61.6	10.2	35.9	699.9
5.	4.0	7.5	19.2	30.0	20.7	386.5
	0.9	4.8	9.7	14.6	20.1	271.5
6.	6.5	8.3	32.4	12.3	41.8	407.4
	1.8	0.7	17.4	4.9	31.2	189.8

7. Subtract the numbers in ex. 3–6 and check the work.

8. Add 3.9, 4.8, 0.7, 2.0, 6.1.



HOW FAR DID THEY DRIVE?

1. Have you ever read the speedometer of an automobile to see how many miles you have traveled? The part of the speedometer that shows how far the car has been driven is illustrated at the right. This shows that the car has traveled 2847.6 mi. The right-hand figure shows *tenths* of a mile and is printed in red; the other figures are black.

2. One day John took a trip with his mother. They drove 83.5 mi. in the morning and 124.8 mi. in the afternoon. How many miles did they drive that day?

3. In ex. 2 how many more miles did they drive in the afternoon than in the morning?

Add these numbers and check the work:

4.	3.5	9.7	96.2	77.6	536.9	150.0
	3.5	4.9	29.4	48.4	41.7	81.6
5.	6.3	4.5	87.7	96.3	225.6	360.5
	7.1	4.8	68.0	78.7	183.1	142.8

1. Last year Mr. Reed drove his car 4987.3 mi. while Mr. Fox drove his car 6103.0 mi. How many more miles did Mr. Fox drive last year than Mr. Reed?

2. Three months ago when Mr. White bought a used car the speedometer showed that it had been driven 5254.3 mi. Now the speedometer shows 8046.7 mi. How many miles has Mr. White driven the car since he bought it?

The number of miles Mr. White has driven the car is the difference between 5254.3 mi. and 8046.7 mi.

3. The speedometer on Mr. Bell's car read 1528.7 mi. before a trip and 1715.3 mi. after the trip. How many miles did Mr. Bell drive on that trip?

4. When Mr. Cox drove his car into his garage on Wednesday night, the speedometer read 2173.0 mi. On Thursday night, the speedometer read 2341.3 mi. On Friday night, the speedometer read 2391.1 mi. How many miles did he drive on Thursday? on Friday?

5. On Saturday morning the speedometer on Mr. Smith's car read 1673.8 mi. If he drives 125.4 mi. on Saturday, what will the speedometer read at the end of the trip?

Subtract. Check the work by adding:

6.	9207.4	5000.0	7375.1	1883.5	2200.6
	2009.3	4813.5	4560.8	746.6	1575.0
7.	6500.0	3889.2	8544.6	4726.5	5260.0
	2066.0	1505.7	3219.9	1777.5	2500.5
8.	1000.0	9625.3	2985.3	5743.5	8134.6
	755.3	4288.6	1699.9	4243.7	1877.5
9.	4128.5	3000.0	6202.8	3272.0	7128.3
	2205.7	1885.4	2400.7	1844.5	4025.6

Copy these numbers in columns and add them:

1. 92.4 + 53.6 + 7.5 + 21.9 + 43.8
2. 40.5 + 6.8 + 79.3 + 66.6 + 5.9
3. 35.4 + 8.5 + 49.7 + 6.8 + 14.6

Add up. Check by adding down:

4.	5.9	55.8	59.9	98.7	16.7	64.7
	9.4	27.9	87.2	36.9	87.3	52.3
	3.7	53.5	41.4	63.4	58.3	48.8
5.	4.7	98.1	57.6	69.6	8.9	9.6
	8.2	36.3	72.8	37.1	87.4	24.5
	8.8	13.6	81.3	45.2	15.2	11.7
6.	2.5	33.4	38.1	85.4	31.8	25.9
	5.6	19.3	47.8	84.7	97.6	59.7
	6.8	44.5	15.2	21.3	23.5	12.3
	6.9	72.8	24.4	77.8	53.2	60.1

Subtract. Check by adding up:

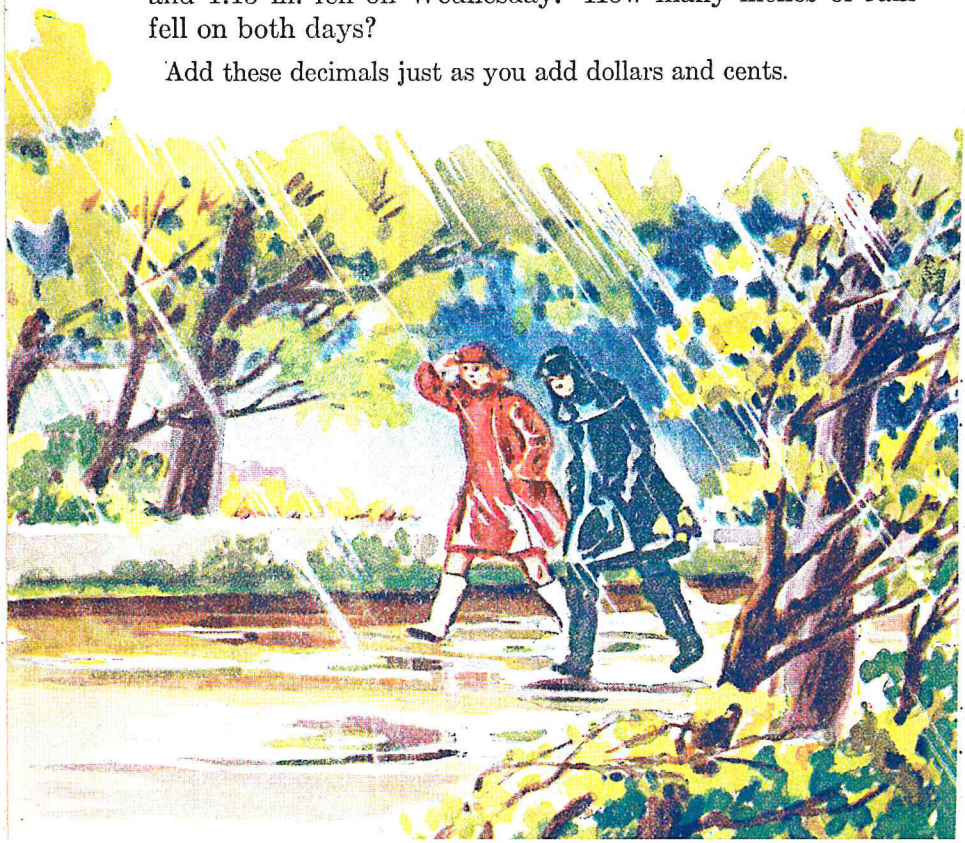
7.	9.5	50.6	96.2	26.4	10.0	73.4
	5.9	18.2	68.3	22.6	8.3	55.7
8.	7.7	72.1	81.8	44.0	80.5	11.0
	4.9	35.3	25.9	18.7	44.6	4.6
9.	6.6	83.2	97.2	62.5	34.1	12.6
	2.8	58.7	37.9	34.8	17.7	7.6
10.	9.5	75.4	40.3	51.2	89.0	91.1
	5.3	16.5	23.7	37.4	21.2	71.4
11.	6.3	82.3	61.5	85.7	50.0	67.9
	4.5	65.4	37.9	36.3	18.6	59.5

1. The amount of rain that falls is measured in inches. If you want to know how much rain falls during a storm, put a pan outdoors to catch the rain. When the storm is over, measure the depth of the water in the pan; if it is $\frac{1}{2}$ in. deep, you say that $\frac{1}{2}$ in. of rain fell. When the Weather Bureau reports the amount of rain it will state that .50 in. fell, since the Weather Bureau measures rain to *hundredths* of an inch. Show that $\frac{50}{100}$ in. is the same as $\frac{1}{2}$ in.

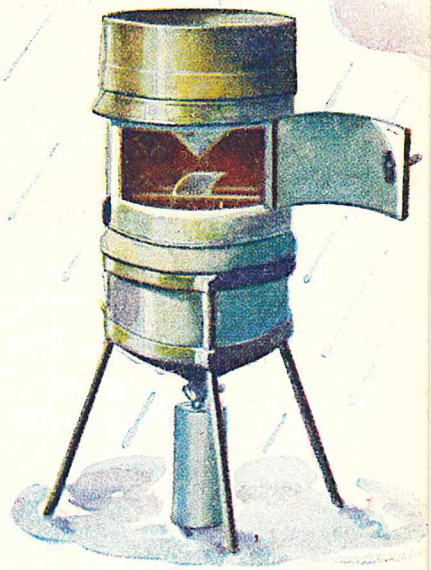
2. When measurements are made to hundredths of an inch, the inch is divided into 100 parts as shown at the right. This picture is somewhat enlarged; that is, it is a little over 1 in. long.

3. After two days of heavy rain the Weather Bureau reported in the paper that 2.52 in. of rain fell on Tuesday and 1.15 in. fell on Wednesday. How many inches of rain fell on both days?

Add these decimals just as you add dollars and cents.



MEASURING RAINFALL



1. The picture at the right shows a rain gauge which the Weather Bureau uses to measure rainfall. The rain enters at the top of the gauge and passes through the funnel which is on the inside. Each time .01 in. of rain collects in the gauge, it is recorded by an electric device.

2. At Atlanta one day in September the rain gauge showed that 1.75 in. of rain fell the first hour of a storm and 1.42 in. fell during the second hour. How many inches of rain fell during those two hours?

3. The total rainfall in Chicago one year was 29.58 in. The total rainfall in Boston that year was 46.31 in. How many more inches of rainfall did Boston have than Chicago?

Add these numbers and check the work:

4.	.02	0.13	5.11	17.15	36.07	50.17
	.07	4.28	6.84	12.09	15.13	43.12
5.	.63	0.47	6.02	16.82	18.05	17.16
	.42	0.32	4.37	11.43	17.91	18.43
	.07	0.12	9.17	4.00	13.59	11.96

Subtract these numbers and check the work:

6.	.35	6.37	7.17	16.37	28.04	14.50
	.28	0.28	5.92	12.51	17.28	10.19
7.	.83	9.20	4.07	83.50	40.35	15.15
	.09	4.55	2.98	29.72	25.18	9.83

MILES		A.M.	A.M.	P.M.	P.M.
0.0	New York	6:30	11:45	**1:50**	**3:05**
58.1	Trenton	7:33	**12:50**	**2:54**	**4:05**
90.3	Philadelphia	8:10	**1:31**	**3·35**	**4:48**
186.5	Baltimore	9:46	**3:17**	**5:13**	**6:29**
226.6	Washington	10:30	**4:10**	**6:10**	**7:15**
340.0	Richmond	**1:30**	**7:20**	**9:20**	**10:00**

1. Mary Jane's father brought home a timetable showing trains from New York to Richmond, Virginia. A part of this timetable is shown above. The left-hand column of the table shows how many miles each station is from New York. These distances are given to *tenths* of a mile. How many miles is it from New York to Richmond? from Trenton to Philadelphia? from Philadelphia to Baltimore? from Philadelphia to Washington? from Baltimore to Washington? from Washington to Richmond?

2. If Mary Jane's father goes by train from New York to Richmond and back again, how many miles does he travel?

3. The columns at the right show the hours when trains leave New York for Richmond. The first train leaves at 6:30 A.M. At what time does it arrive in Richmond? How long does the trip from New York to Richmond take?

In the table, hours in the morning (before noon) are printed in light type like this: 6:30. Hours in the afternoon and evening (up to midnight) are printed in dark type like this: **3:05.**

4. Find the time that each of the other trains takes to go from New York to Richmond. Which is the fastest trip?

5. How long does each train take to go from Philadelphia to Washington? from Philadelphia to Richmond?

6. Bring to class a timetable for a bus or railroad and show the class how to read it.

1. Our class party cost $8.61. If we share the expense equally, how much should each of the 37 pupils pay? How many pupils should each pay an extra cent?

2. We sold 300 tickets for the school play at 25¢ a ticket. How much money did we get for the tickets?

3. A train makes a run of 1482 mi. in 38 hr. What is its average speed per hour?

4. If Jack can earn 75¢ a week, how many weeks will it take him to earn enough to buy a watch costing $10.50?

Divide and check. If there is a remainder, write R before it:

5.	32)3011	35)1651	76)5553	79)8532	58)42340
6.	55)4738	67)1285	38)2151	43)3741	16)13669
7.	24)2099	33)3009	46)1297	18)1523	96)48768
8.	42)5381	57)4792	23)6099	87)4187	39)19349
9.	89)5073	78)3605	56)2361	66)9245	45)28582

Multiply and check:

10.	87	725	486	9246	1438	3059
	24	39	307	12	95	73
11.	72	946	594	1072	2760	5217
	67	42	865	48	58	92
12.	69	368	359	7259	4863	8594
	19	86	614	57	94	32
13.	90	489	736	5327	8623	4185
	96	58	673	38	27	56

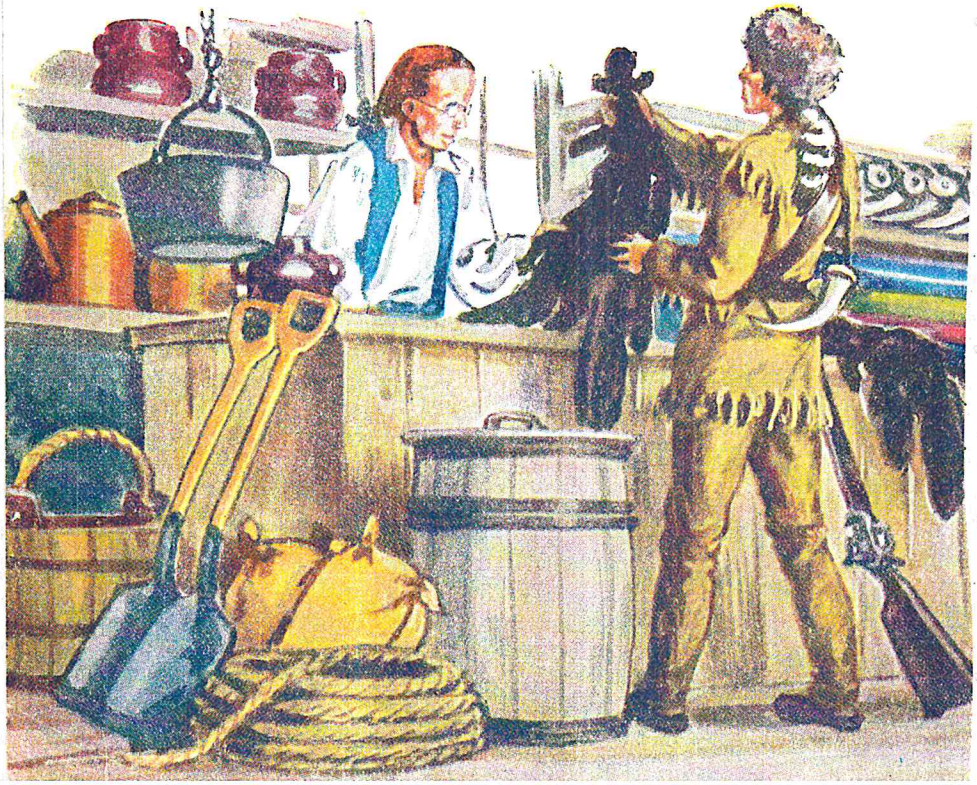
BARTER ON THE FRONTIER

In the early years of our country most of the people lived on farms. These people had very little real money, so they usually exchanged the things they had in plenty for other things they needed. Tobacco, corn, and the skins of wild animals were used as money.

1. It took 8 bu. of corn to buy 1 yd. of calico. Mrs. James needed $7\frac{1}{4}$ yd. of calico to make a dress. How many bushels of corn did Mr. James exchange for the calico?

2. A doctor in Virginia charged 400 lb. of tobacco for 6 visits after dark to a sick family. This was at an average of how many pounds of tobacco for each visit?

3. In Connecticut a storekeeper exchanged 192 bu. of corn for 8 barrels of salt pork. How many bushels of corn would pay for 1 barrel of salt pork at that time?

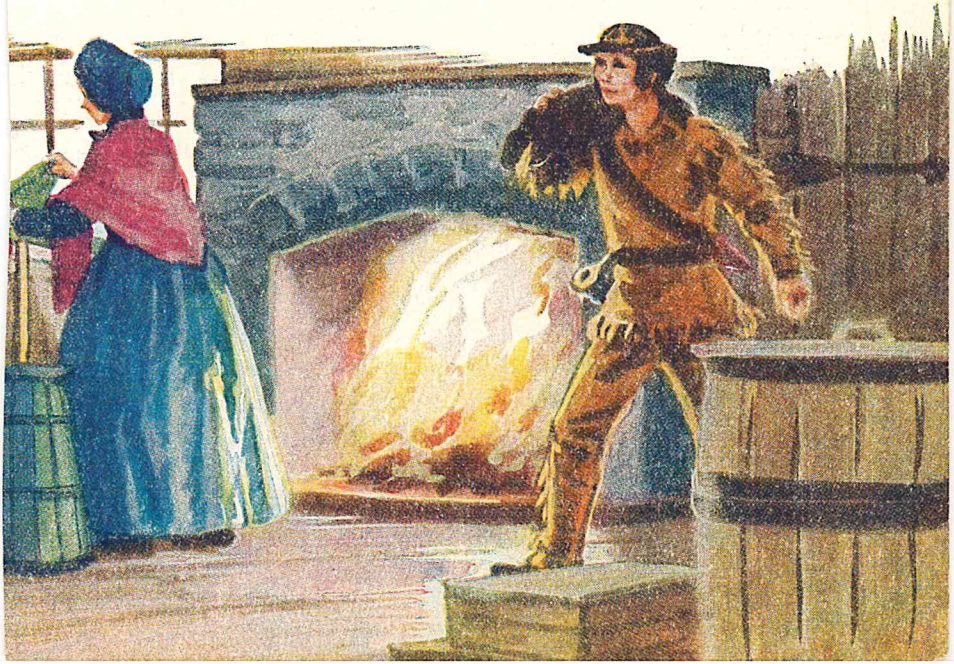


4. In Colonial days 1 beaver skin would buy 8 lb. of gunpowder at Albany, New York, and only 4 lb. at Montreal. If the value of gunpowder was the same in both places, in which place were beaver skins less valuable?

5. Before the Revolutionary War, Daniel Boone had a general store in Kentucky where pioneers exchanged the skins of animals for the things they needed. The values of skins and other things were given in shillings. A beaver skin was worth 18 shillings; a bear skin, 10 shillings; a fox skin, 3 shillings. Bill Brown bought an axe for which he paid 1 beaver skin, 1 bear skin, and 3 fox skins. How many shillings was the axe worth?

6. The Colony of Virginia paid a man 48 beaver skins for building a sawmill. The man sold the 48 beaver skins for 18 shillings each. How many shillings did he get for them?

7. In 1785, in that part of the country now called Tennessee, new prices were fixed by law on goods to be exchanged. The price of a raccoon skin was fixed at 1 shilling and a deerskin at 6 shillings. How many yards of linen cloth worth 3 shillings a yard could Tom Hill buy at that time for 3 deerskins and 3 raccoon skins?



DRAWING TO SCALE

1. The map above shows two roads in the country that meet at the school. On this map 1 in. stands for 1 mi. With your ruler measure the length of the line from the school to Ed's house. (Measure the distance between the 2 marks.) Do you find this length to be just 1 in.? This means that the school is 1 mi. from Ed's house.

2. Now measure on the map the length of the line from Ed's house to the store. If you measure correctly, the length is $1\frac{1}{4}$ in. This means that the store is $1\frac{1}{4}$ mi. from Ed's house. Then measure the length of the line from the school to the store. How long is the line? How many miles is it from the school to the store?

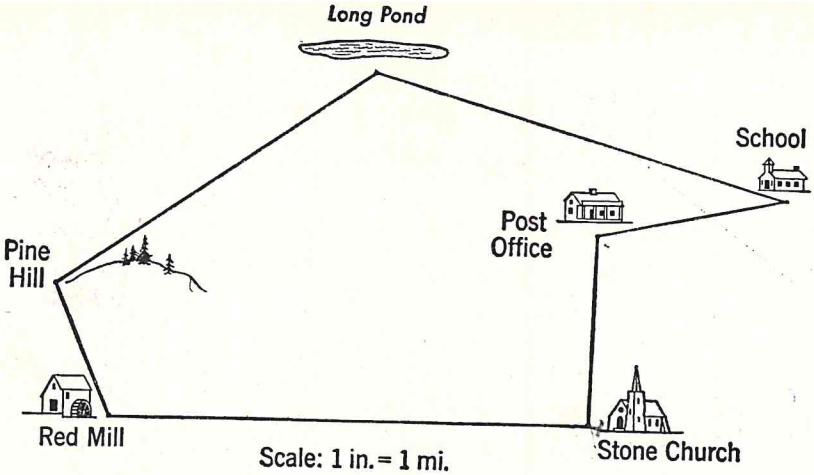
3. How many miles is it from the store to the church? How many miles is it from Ed's house to the church? from the school to the church?

4. How far is it from Ann's house to the school? How far is it from Ann's house to the store if she goes by the roads? How far is it from Ann's house to the church if she goes by the roads?

5. When you make a drawing like a map and let a short line like an inch stand for a long distance like a mile, you are *drawing to scale.* In the map at the top of the page the scale is: 1 in. = 1 mi.

6. On the map above, suppose there were a straight road from Ann's house to Ed's house. About how many miles would that distance be? Use your ruler to measure it.

7. Draw a map like the one at the top of the page but change the distances like this: From the school to Ed's house should be $1\frac{1}{2}$ mi.; from Ed's house to the store should be 1 mi.; from the store to the church should be 2 mi.; from the school to Ann's house should be $2\frac{1}{4}$ mi. On your map let 1 in. = 1 mi.



TO PINE HILL FOR A PICNIC

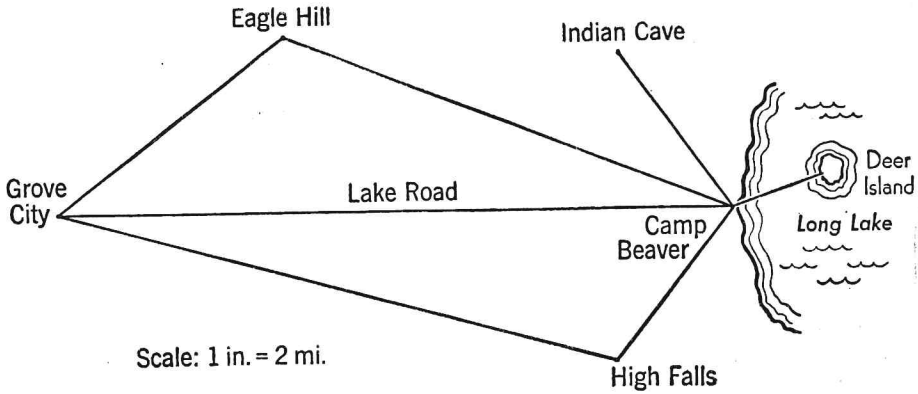
1. On Saturday morning the members of the Bicycle Club rode to Pine Hill for a picnic. To find the way they used the map shown above. On this map 1 in. = 1 mi.

2. The club members met at the school and started their trip at 10 o'clock. First they rode from the school to the post office; how many miles is that? On the map measure the distance between the two dots with a ruler, remembering that 1 in. on the map stands for 1 mi.

3. From the post office they rode ... mi. to the Stone Church. Tell the distance that goes in the space. From the stone church they rode ... mi. to the red mill and continued another ... mi. until they reached Pine Hill where they had their picnic. How many miles in all was the trip from the school to Pine Hill?

4. In the afternoon they came back another way. From Pine Hill they rode ... mi. to Long Pond; then they rode ... mi. from Long Pond to the school. How many miles in all was the trip back? How many miles shorter was the trip back in the afternoon than the trip in the morning?

5. Draw a map showing a different trip the club can take next Saturday. Let 1 in. = 1 mi. Make up the places and distances. See if the class can read your map.



CAMP BEAVER

1. Last summer George and Arthur went to Camp Beaver. The map above shows the camp and the country around it. The scale on the map reads: 1 in. = 2 mi. This means that 1 in. on the map represents 2 mi. on the ground. How many miles are represented by $\frac{1}{2}$ in.? by $1\frac{1}{2}$ in.? by 2 in.? by $2\frac{1}{2}$ in.? by 3 in.? by $3\frac{1}{2}$ in.?

2. The boys got off the train at Grove City and rode in a bus over Lake Road to Camp Beaver. On the map measure with a ruler the distance they rode in the bus; how many miles is it?

3. While at camp they walked around the country. How many miles is it from the camp to High Falls?

4. How far is it from Camp Beaver to Eagle Hill? How far is it from Eagle Hill to Grove City? from Camp Beaver to Indian Cave?

5. The boys rowed a boat to Deer Island. How many miles is it from the camp to Deer Island?

6. How far is a trip from the camp to Grove City by way of High Falls? by way of Eagle Hill?

7. Use a scale of 1 in. = 2 mi. and draw lines showing distances of 1 mi., 2 mi., 3 mi., 4 mi., 5 mi., 6 mi.

Add up. Check the work by adding down:

1.	348	644	874	131	952	913	167
	522	166	171	205	777	871	449
	355	203	623	139	943	370	396
	484	326	574	630	658	289	225
	283	194	228	587	581	606	306
	236	423	508	526	205	559	232

Subtract. Check by adding:

2.	28302	62900	15840	38545	37821
	19006	53816	14448	27123	19763
3.	51916	80000	23510	93456	72399
	51794	21986	9340	7889	37757
4.	60000	33316	77822	40000	44158
	31392	5283	65149	7453	12474

Multiply. Check by interchanging the numbers:

5.	941	632	580	362	785
	738	502	469	186	350
6.	419	875	326	904	67
	214	578	741	623	900

Divide. Check by multiplying:

7.	18,972 ÷ 36	$254.28 ÷ 52	12,315 ÷ 15
8.	13,058 ÷ 19	$200.55 ÷ 21	10,092 ÷ 29
9.	34,768 ÷ 41	$334.88 ÷ 92	60,709 ÷ 75
10.	20,807 ÷ 25	$132.63 ÷ 14	19,254 ÷ 33
11.	18,611 ÷ 37	$173.94 ÷ 26	40,826 ÷ 57
12.	14,832 ÷ 49	$195.16 ÷ 28	14,076 ÷ 18

1. Jane paid \$3.87 for her yellow sweater. She said that was \$.98 more than she paid for her blue sweater. How much did Jane pay for her blue sweater?

2. Mary wants to make a dress for her little sister. The pattern calls for $2\frac{1}{4}$ yd. of cloth. Mary has 2 yd. and 12 in. of cloth. Is that enough cloth to make the dress?

3. Tom's mother asked him to get for her 10 two-cent stamps, 30 three-cent stamps, and 5 five-cent stamps. How much change should Tom get from \$1.50?

4. Jack ordered these things for his mother: a 5-pound bag of potatoes for \$.25, $1\frac{1}{2}$ lb. of beans at \$.19 a pound, a can of peaches for \$.27, 2 cans of corn at \$.13 a can. How much was the bill?

5. Mrs. Green bought $\frac{3}{4}$ doz. rolls at 24¢ a dozen and $1\frac{1}{2}$ doz. cup cakes at 35¢ a dozen. How much in all did these things cost?

6. Mrs. Brown pays Henry 35¢ an hour for helping her. She pays him at the end of the week. Last week Henry worked $1\frac{1}{2}$ hr. on Monday, $\frac{3}{4}$ hr. on Tuesday, $1\frac{1}{4}$ hr. on Thursday, and $2\frac{3}{4}$ hr. on Saturday. How much in all did Henry earn last week helping Mrs. Brown?

7. Bill's father used 56 gal. of gasoline on a trip of 1288 mi. How many miles per gallon of gasoline did he average?

8. Alice weighs $78\frac{1}{4}$ lb. and Helen weighs $75\frac{1}{2}$ lb. What is the difference in their weights?

9. Mr. Fox made an automobile trip to Washington. When he left home the speedometer of the car read 26,548 mi. When he reached Washington the speedometer read 26,713 mi. How many miles long was the trip? If the trip took 5 hr., he drove the car at what average speed in miles per hour?

10. A train due at 3:50 P.M. will be 35 min. late. At what time will the train arrive?

Add. Check by going over the work:

1. $2\frac{1}{5}$	$3\frac{1}{2}$	$5\frac{3}{10}$	$2\frac{11}{16}$	$2\frac{7}{10}$	$5\frac{7}{12}$	$3\frac{1}{2}$
$3\frac{4}{5}$	$2\frac{7}{8}$	$2\frac{3}{10}$	$4\frac{3}{16}$	$\frac{3}{10}$	$3\frac{11}{12}$	$4\frac{1}{3}$
2. $2\frac{1}{5}$	$5\frac{1}{2}$	$1\frac{3}{4}$	$3\frac{1}{6}$	$8\frac{1}{3}$	$7\frac{5}{6}$	$4\frac{1}{5}$
$\frac{1}{2}$	$3\frac{5}{8}$	$2\frac{1}{3}$	$1\frac{1}{2}$	$4\frac{5}{12}$	$3\frac{11}{12}$	$3\frac{7}{10}$
3. $3\frac{1}{2}$	$3\frac{1}{4}$	$5\frac{5}{6}$	$3\frac{3}{10}$	$5\frac{1}{2}$	$6\frac{3}{4}$	$2\frac{1}{4}$
$4\frac{1}{3}$	$2\frac{3}{8}$	$4\frac{1}{2}$	$2\frac{1}{5}$	$3\frac{11}{16}$	$5\frac{1}{3}$	$5\frac{3}{8}$
$2\frac{1}{12}$	$1\frac{1}{16}$	$3\frac{5}{12}$	$3\frac{1}{2}$	$2\frac{1}{8}$	$2\frac{1}{12}$	$4\frac{1}{2}$

Subtract. Check by going over the work:

4. $6\frac{1}{2}$	$4\frac{1}{2}$	$3\frac{9}{16}$	$5\frac{3}{5}$	$4\frac{7}{12}$	$3\frac{2}{3}$	$4\frac{3}{8}$
$5\frac{1}{3}$	$\frac{1}{2}$	$2\frac{9}{16}$	$2\frac{1}{5}$	$3\frac{1}{4}$	3	$2\frac{3}{4}$
5. $\frac{7}{10}$	6	$2\frac{9}{10}$	$3\frac{5}{8}$	$9\frac{1}{2}$	$4\frac{1}{6}$	$8\frac{1}{4}$
$\frac{5}{10}$	$5\frac{1}{3}$	$\frac{2}{5}$	$1\frac{9}{16}$	$7\frac{5}{12}$	$2\frac{5}{6}$	$3\frac{5}{12}$
6. $6\frac{1}{2}$	$5\frac{7}{8}$	$9\frac{1}{3}$	$7\frac{2}{5}$	$5\frac{1}{12}$	$4\frac{1}{2}$	7
$5\frac{7}{8}$	$2\frac{9}{16}$	$6\frac{5}{6}$	$4\frac{9}{10}$	$2\frac{3}{4}$	$3\frac{9}{10}$	$4\frac{5}{8}$

Multiply. Check by going over the work:

7.	$3 \times \frac{1}{8}$	$2\frac{1}{4} \times 5$	$\frac{3}{4} \times 68$	$5 \times 17\frac{1}{2}$	$3\frac{1}{2} \times \$1.18$
8.	$\frac{5}{9} \times 45$	$3\frac{1}{8} \times 15$	$6 \times \frac{3}{10}$	$4 \times 26\frac{1}{2}$	$2\frac{1}{3} \times \$2.16$
9.	$4 \times \frac{3}{5}$	$5\frac{3}{8} \times 12$	$\frac{7}{8} \times 96$	$9 \times 15\frac{2}{3}$	$4\frac{3}{8} \times \$1.25$
10.	$\frac{3}{5} \times 20$	$2\frac{3}{8} \times 48$	$7 \times \frac{5}{6}$	$7 \times 38\frac{3}{4}$	$5\frac{2}{3} \times \$2.17$
11.	$12 \times \frac{3}{8}$	$4\frac{1}{3} \times 18$	$\frac{2}{3} \times 35$	$6 \times 54\frac{1}{8}$	$2\frac{3}{4} \times \$1.75$
12.	$16 \times \frac{2}{3}$	$6\frac{1}{2} \times 20$	$9 \times \frac{5}{12}$	$3 \times 11\frac{3}{4}$	$1\frac{1}{2} \times \$3.50$
13.	$10 \times \frac{3}{4}$	$2\frac{2}{3} \times 17$	$\frac{3}{4} \times 18$	$7 \times 15\frac{1}{2}$	$3\frac{1}{4} \times \$1.35$
14.	$15 \times \frac{3}{5}$	$1\frac{5}{6} \times 28$	$\frac{5}{8} \times 32$	$8 \times 25\frac{3}{4}$	$6\frac{2}{3} \times \$2.64$

OUR COTTON CROP

1. The United States grows more cotton than any other country. About 20,000,000 people in this country get their living either from growing cotton or from working in factories where cotton goods are made. Are 20,000,000 people about $\frac{1}{6}$, $\frac{1}{7}$, or $\frac{1}{8}$ of all the 140,000,000 people living in this country?

2. Cotton cannot grow in any place where the growing season is less than 200 days. This means that there must be no frost for 200 days. About how many months are there in 200 days? Count 30 days to the month.

3. If the ground is prepared for planting cotton in the early part of March, in what month should the cotton be ready to pick? See ex. 2.

4. It takes 60 days from the time the cotton flower blooms until the boll, or pod, opens. If a cotton flower blooms July 10, about what date should its boll open?

5. Most of the cotton is picked by hand, although some cotton is picked by machine. A good picker may pick as much as 400 lb. in an 8-hour day. What is the average number of pounds he can pick an hour?

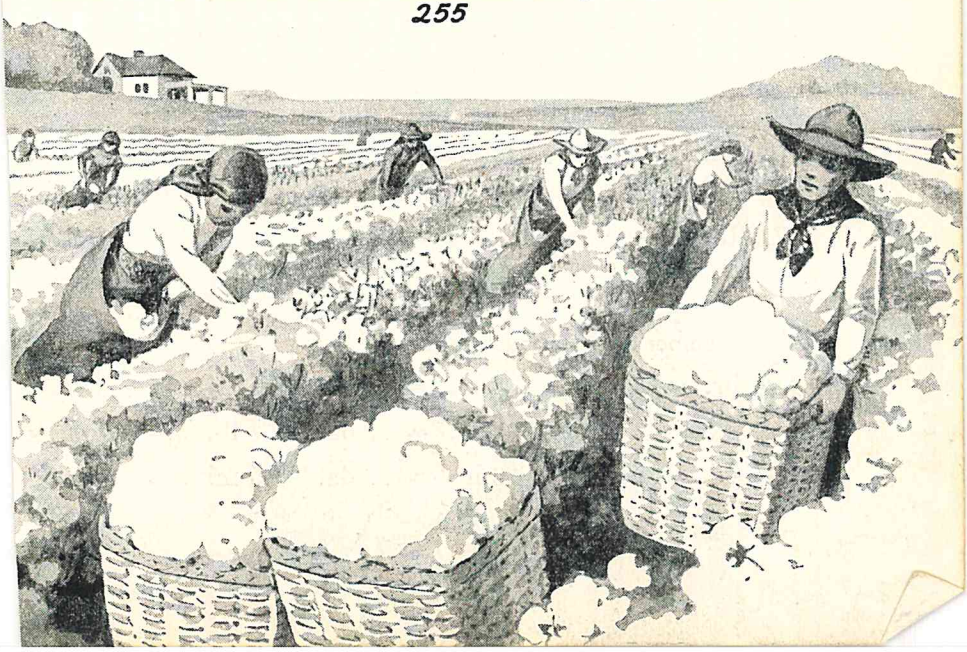
6. In a contest a boy of 15 years picked 129 lb. of cotton in 2 hr. and won the contest. How many pounds better was his average per hour than that in ex. 5?

7. Many years ago before the cotton gin was invented, the cotton seeds were pulled away from the cotton fiber, or lint, by hand. It took one person a full day to separate 1 lb. of lint from the seeds. At that rate, how many days would it take a person to remove the seeds from enough cotton to make a bale containing 475 lb. of cotton? If that person worked an average of 25 days a month, how many months would it take?

8. The cotton gin is a machine that separates the seed from the cotton. It was invented in 1793 by Eli Whitney. How many years ago was that?

9. After the seeds have been removed by the cotton gin, the cotton is pressed into bales to be shipped. A bale weighs about 500 lb. This weight is made up of 475 lb. of cotton; the rest of the weight is wrapping. How many pounds does the wrapping weigh? What part of the total weight of a bale is the wrapping? What part of a ton does a 500-pound bale of cotton weigh?

10. Most of the cotton in the world is grown in the southern part of the United States. Look up the names of 6 states that grow large crops of cotton and report to the class the number of bales of cotton that each one produces annually.



1. Add 5 to each number; add 7; add 8; add 9:

38 95 26 49 57 64 81 73

2. Subtract 8 from each number; subtract 7; subtract 20:

72 38 96 69 45 24 57 83

3. How much is 10×245? 100×36?

4. What is the next number after 20,999?

5. How many minutes is it from 8:25 A.M. to 9:04 A.M.?

6. What is the difference between 48 and 56?

7. What is the product of 18 and 5?

8. What is the quotient of 18 and 5?

9. At 48¢ a pound, what will $\frac{3}{4}$ lb. of cheese cost?

10. At 56¢ a dozen, what will 6 oranges cost?

11. Fred bought a can of tomatoes marked "Net Weight, 1 lb. 4 oz." How many ounces is that?

12. How many dozen eggs will 40 eggs make?

13. How much change will you get from $5.00 if your bill is $4.37? Count the change as the clerk would do.

14. Bill is 45 in. tall. Joe is 49 in. tall. How many feet and inches tall is each boy?

15. How many inches are there in 5 ft. 4 in.? 3 ft. 7 in.?

16. Change each fraction to a mixed number:

$\frac{9}{8}$ $\frac{7}{3}$ $\frac{10}{4}$ $\frac{16}{5}$ $\frac{18}{16}$ $\frac{33}{6}$ $\frac{25}{12}$ $\frac{53}{10}$ $\frac{47}{6}$

17. Reduce each fraction to lowest terms:

$\frac{8}{10}$ $\frac{4}{6}$ $\frac{8}{12}$ $\frac{12}{16}$ $\frac{10}{12}$ $\frac{6}{8}$ $\frac{18}{20}$ $\frac{25}{30}$ $\frac{42}{56}$

Tell the number to put in each space:

18. $\frac{3}{4}$ hr. = .. min. 4 bu. = .. qt. $\frac{1}{4}$ min. = .. sec.

19. $\frac{1}{2}$ pk. = .. qt. 3 lb. = .. oz. $\frac{3}{8}$ lb. = .. oz.

20. $\frac{1}{3}$ yd. = .. in. 6 hr. = .. da. 15 min. = .. hr.

1. $413.43
54.56
368.95
432.39
237.37

2. $513.43
37.67
59.75
227.84
246.26

3. $650.00
− 552.38

4. 70137
− 51259

5. $43.58
× 20

6. 2695
× 75

7. 708
× 468

8. 365
× 639

9. $6\frac{3}{4}$
$+ 2\frac{2}{3}$

10. 5
$- 1\frac{3}{8}$

11. $5\frac{5}{12}$
$- 4\frac{1}{2}$

12. $32\overline{)3040}$

13. $45\overline{)2885}$

14. $86\overline{)34856}$

15. $16\overline{)7528}$

16. Write in Roman numerals: 45, 98, 67, 235, 450, 1940.

17. Read these numbers: LXXXII, CIV, CDL, CCX, MDXL, MDCCCIX.

18. Write in figures: one hundred thousand eighty-two; seven and six hundredths; eight million, thirty-five thousand, six hundred fifty-five.

19. Find $\frac{3}{4}$ of each number: 20, 32, 48, 76, 150, 475.

20. Multiply each number by $6\frac{2}{3}$: 18, 35, 27, 42.

Use the numbers 48 and 12 to answer each question below:

21. What is the sum of these numbers?

22. What is the product of these numbers?

23. What is the difference between these numbers?

24. What is the quotient of these numbers if you use the smaller number as the divisor?

25. The smaller number is what part of the larger number?

26. Write an improper fraction using these numbers.

27. What is the numerator of the fraction you wrote in ex. 26? What is the denominator?

28. What is $\frac{2}{3}$ of each number? $\frac{3}{4}$ of each number?

1. Mr. King pays John 40¢ an hour to clean the yard and cut the grass. How much does John get if he works $1\frac{3}{4}$ hr.? if he works $2\frac{1}{2}$ hr.? if he works 1 hr. and 15 min.?

2. Mrs. West buys soap at 9¢ a bar. How much can she save on a dozen bars if she buys a dozen for 89¢?

3. Last year in Centerville the rainfall for March was 3.82 in.; this year in March it was 5.51 in. How many more inches of rain fell in March this year than last year?

4. Mrs. Lee bought a piece of gingham. There were $7\frac{1}{2}$ yd. in the piece. She used $2\frac{3}{4}$ yd. for a dress for Kate and $3\frac{1}{8}$ yd. for a dress for Grace. Did she have enough gingham left to make an apron requiring $1\frac{1}{8}$ yd.?

5. A fast train averages 45 mi. an hour. How many hours will it take to go a distance of 735 mi.?

6. Find the cost of a quart of milk at 16¢ and $2\frac{1}{2}$ lb. of cookies at 38¢ a pound.

7. Three boys are planning to buy a tent that costs $16.98 and to share the cost equally. Jack now has $2.75. How much more money does he need to pay his share?

8. The round-trip fare to Atlantic Beach is $.55. Our class of 35 pupils can hire a bus for $14.00 to take us to the beach and back. How much can each pupil save on his fare if we hire the bus?

9. Jack went fishing yesterday. He caught fish that weighed $2\frac{1}{4}$ lb., $3\frac{3}{16}$ lb., and $2\frac{1}{8}$ lb. What was the weight of these three fish?

10. A road map shows that the distance from Newton to Springdale is 15.5 mi. and from Springdale to Greenfield is 24.8 mi. How many miles is it from Newton to Greenfield by that road?

11. Find the average height of 4 boys whose heights are 52 in., 58 in., 55 in., and 57 in.

Addition Test

Add. Write the answers on folded paper: Time: 5 min.

1.	24678	40735	31878	47855
	6965	23484	617	694
	53323	52126	1180	4679
	13034	7416	766	23308
2.	16294	35853	25355	48778
	34760	395	32789	27446
	12907	17618	3442	52636
	89251	2205	860	12712
	25227	17023	17359	65537

Subtraction Test

Subtract. Write the answers on folded paper: Time: 4 min.

3.	62251	39643	50000	60777
	12357	17474	20565	38084
4.	81974	90002	65118	33857
	52549	52135	17259	26507
5.	40000	75380	80908	17525
	38019	29400	42699	13838

Multiplication Test

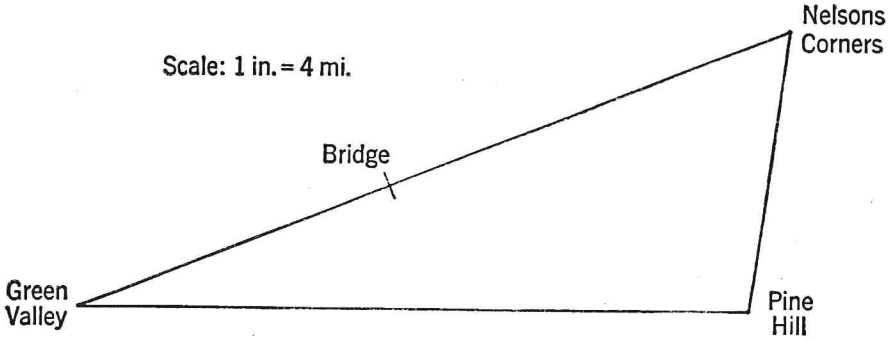
Copy and multiply: Time: 4 min. after copying.

6.	937	794	685	8465	4709
	308	527	490	36	19

Division Test

Copy and divide: Time: 8 min. after copying.

7.	33)19628	57)45926	69)51328	23)16928
8.	24)23064	13)10653	35)34771	48)39072



CAN YOU READ JACK'S MAP?

1. Jack lives in Green Valley. He drew the map shown above which gives the distances from Green Valley to some near-by towns. On Jack's map 1 in. = 4 mi. With your ruler measure the distance on the map from Green Valley to Pine Hill. How many inches is it? How many miles is it from Green Valley to Pine Hill?

2. On the map find the distance in inches between these places. Then find the distance in miles:
(a) From Pine Hill to Nelsons Corners
(b) From Nelsons Corners to the bridge
(c) From the bridge to Green Valley

3. If Mr. Bell drives his car from Green Valley to Nelsons Corners, how many miles is it by the direct road? How many miles is it if he goes by way of Pine Hill?

4. On a sheet of paper carefully copy the map at the top of the page, using the scale of 1 in. = 4 mi. On your map show these new places, using the same scale:

The church which is 4 mi. east of Nelsons Corners;
Star Lake which is 10 mi. west of Nelsons Corners;
Boonville which is 2 mi. north of Star Lake;
Hanover which is 6 mi. north of Green Valley;
Swan Lake which is 3 mi. northeast of Pine Hill.

Vegetable Garden	Flower Garden

HOW LARGE IS EACH GARDEN?

1. The gardens above are drawn to scale but the scale is not given. If these were very small gardens for a doll's playhouse, the scale might be 1 in. = 1 ft. Using this scale, tell the length and width of each garden in feet. Measure the lines with your ruler.

2. Suppose these gardens were planted by Tom. If they were small gardens the scale might be 1 in. = 4 ft. Using this scale, tell how many feet long and wide each garden is. Tell the size of each garden if the scale were 1 in. = 8 ft.

3. Measure each line below. How many feet does each line represent if the scale is 1 in. = 1 ft.?

How many feet long is each line if the scale is 1 in. = 2 ft.? if the scale is 1 in. = 4 ft.?

4. On a sheet of paper make a scale drawing of a garden letting 1 in. = 4 ft. On your drawing mark the length of each line in feet.

5. On a large sheet of paper make a scale drawing of a rectangular garden that is 20 ft. wide and 35 ft. long. Let 1 in. = 5 ft.

At the end of each problem there are three numbers. Select the number you think is nearest to the right answer. Then work the problem and compare the answer with the number selected:

1. There are 395 pupils in Knox School and 403 pupils in Lincoln School. How many pupils are there in both schools? (750 pupils; 800 pupils; 1295 pupils)

2. A fast train travels at an average speed of 48 mi. an hour. How many hours will it take the train to cover a distance of 500 mi.? (10 hr.; 9 hr.; 12 hr.)

3. The teacher says that this year there are 12,983 people living in Weston and 18,075 people living in Greenville. How many more people live in Greenville than in Weston? (6000 people; 5000 people; 500 people)

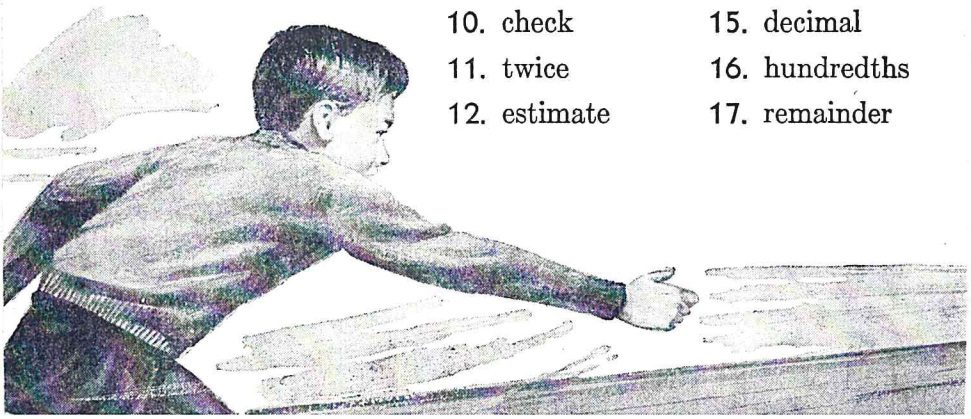
4. It costs $9.75 for a week at camp. Find the cost of 12 weeks at camp. ($108; $1200; $120)

5. There are 29 pupils in our class. If we pay $9.00 for a bus to take us to Sunset Park, how much is each one's share of the cost? ($.50; $3.00; $.30)

THE LANGUAGE OF ARITHMETIC

Show that you know what each word means by using it in a sentence or by giving an illustration of it:

6. sum
7. inch
8. ton
9. peck
10. check
11. twice
12. estimate
13. average
14. eighths
15. decimal
16. hundredths
17. remainder



1. Tom went on a trip with his Scout troop. They walked $8\frac{3}{4}$ mi. to Black Falls, $6\frac{1}{2}$ mi. to Indian Hill, and $11\frac{3}{4}$ mi. to get home. How many miles did they walk in all?

2. It takes Henry 12 hr. to make a birdhouse. How many hours will he take to make 18 birdhouses?

3. For his garden Bill wants $2\frac{1}{2}$ doz. tomato plants at \$.50 a dozen and $1\frac{1}{2}$ doz. cabbage plants at \$.40 a dozen. How much will all these plants cost?

4. Betty made 24 sandwiches for a picnic. She paid 30¢ for bread, 13¢ for butter, and 47¢ for sandwich filling. What was the average cost per sandwich?

5. Alice practiced her music lesson from 3:40 P.M. until 4:20 P.M. What part of an hour did Alice practice?

6. Joe buys 2 pencils at 5¢ each, and a book for 27¢. How much change does he get from \$1.00? What is the smallest number of coins that will make the change?

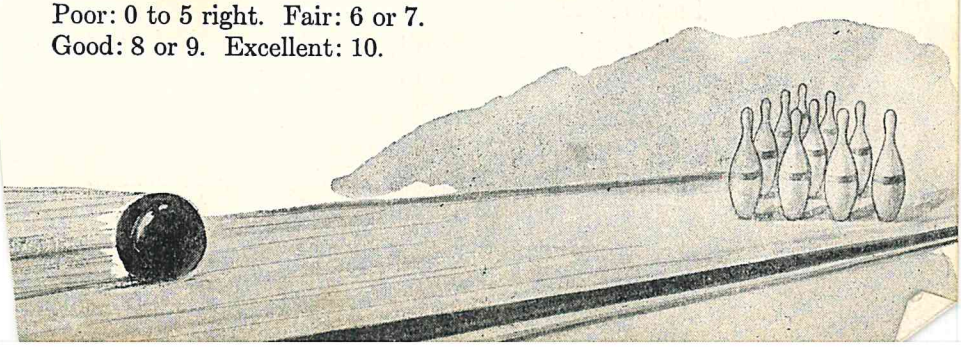
7. Mrs. Hunt paid \$9.92 for milk in March. What was the average cost of the milk per day?

8. At 25¢ a ticket, how many tickets must Bill sell to get a total of \$5.00?

9. One train leaves New York at 8:35 A.M. and reaches Washington at 12:55 P.M. Another train leaves New York at 5:30 P.M. and reaches Washington at 9:20 P.M. What is the difference in time for the two trains?

10. George weighed $77\frac{3}{4}$ lb. last September. Now he weighs $82\frac{1}{2}$ lb. How many pounds has George gained?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



1. Henry got a new bicycle on his birthday. The first week he rode it 9.6 mi.; the second week, 5.8 mi.; and the third week, 7.0 mi. How many miles all together did he ride in the three weeks?

2. Jack rode his bicycle 12.3 mi. last week. This week he rode it 7.5 mi. How much farther did Jack ride last week than this week?

3. The speedometer on Mr. Green's car read 2486.3 mi. on Monday morning. At the end of the week the speedometer read 2552.1 mi. How many miles did Mr. Green drive his car that week?

4. In a recent year the rainfall in New York City was 1.06 in. in November and 7.03 in. in December. How much more rain fell in December than in November?

5. That year the total rainfall was 46.33 in. for New York and 77.30 in. for Miami, Florida. How much more rain fell in Miami than in New York that year?

6. On a map the distance between two cities is $1\frac{1}{2}$ in. If 1 in. on the map represents 1 mi. on the ground, how many miles is it from one city to the other?

7. Read these numbers:

4.6 3.08 14.0 13.50 24.8 0.9

8. Write each number as a decimal or a mixed decimal:

$\frac{9}{10}$ $\frac{3}{100}$ $5\frac{10}{100}$ $4\frac{3}{10}$ $8\frac{16}{100}$ $\frac{7}{100}$

9. Write each number as a common fraction or a mixed number: 0.5 1.08 2.15 .75 18.7 4.01

10. Add and check:

6.4 ft.	1.26 in.	16.3 mi.	25.7 mi.	4.0 lb.
8.3 ft.	3.08 in.	25.6 mi.	8.2 mi.	2.3 lb.
9.7 ft.	9.94 in.	30.0 mi.	34.9 mi.	.7 lb.

11. Subtract 18.6 from 25.3; 46.2 from 85.0; .28 from .65.

DO YOU NEED HELP?

If you miss more than one example in any row, turn to the Practice Page for that row.

Add and check:

						PRACTICE PAGES
1.	4.5	7.4	33.5	29.0	34.5	241
	9.0	10.9	68.9	15.6	48.7	
	3.7	9.3	15.7	22.8	15.6	
	3.9	5.8	41.2	38.5	27.9	
2.	.42	2.62	3.21	2.03	1.40	243
	.65	3.34	4.94	0.55	1.52	
	.56	9.56	3.06	3.32	4.67	
	.79	0.75	8.62	3.00	3.41	
	.44	2.48	7.83	1.78	8.36	
	.68	1.07	1.83	1.66	1.04	

Subtract and check:

3.	9.0	10.0	42.6	83.1	61.9	241
	2.6	7.3	35.9	43.5	27.4	
4.	.75	5.14	3.08	8.00	6.74	243
	.38	3.59	0.76	6.32	3.86	

Write each as a common fraction or a mixed number:

5.	0.4	2.7	.8	15.3	7.2	237
6.	.06	.24	1.36	5.08	2.56	237

Write each as a decimal or a mixed decimal:

7.	$\frac{7}{10}$	$\frac{3}{10}$	$2\frac{6}{10}$	$5\frac{1}{10}$	$8\frac{4}{10}$	237
8.	$\frac{5}{100}$	$\frac{20}{100}$	$\frac{16}{100}$	$4\frac{26}{100}$	$3\frac{9}{100}$	237

Write in figures:

9. Seven hundred fifty and nine hundredths. 237

Diagnostic test.

CHAPTER EIGHT

Areas and Review

JOHN RAISES SWEET CORN

1. John made some money last summer by raising sweet corn and selling it. In a seed catalog John read that Whipple's yellow sweet corn matures in 77 days. This means that it is ready to pick 77 days after it is planted. If he planted the corn on May 14, on what date did it begin to mature? Find the date by counting the days on a calendar.

2. Mary found the maturity date without using a calendar. She said, "After May 14 there are 17 days left in May. I add these 17 days to the 30 days in June, which gives 47 days. To make 77 days, I need 30 days more which must come from July. So the corn matures on July 30." Is Mary right?

3. The seed catalog stated that Golden Giant sweet corn matures in 85 days. John also planted some of that kind on May 14. When did that variety begin to mature?

4. John found that Stowell's Evergreen sweet corn matures in 95 days while Country Gentleman sweet corn matures in 105 days. John planted some of Stowell's Evergreen on May 14 and some of Country Gentleman on May 20. Find the maturity date for each of these varieties.

5. As each planting of corn matured, John found that he could pick good corn from each planting for a week after the maturity date. Study the maturity dates in ex. 1 to 4. Were the maturity dates far enough apart so that John had corn to pick for 4 different weeks during the summer?

MORE ABOUT SWEET CORN

1. The seed for Whipple's yellow sweet corn sells for 45¢ a pound, but if one buys 12 lb. at a time, the price of 12 lb. is $3.72. John and 11 other members of his 4–H Club decided to club together and buy 12 lb. of seed, each boy taking 1 lb. How much per pound did the seed cost when the boys bought 12 lb. at a time? How much did each boy save on his pound of corn by clubbing together?

2. The prices of the other varieties of sweet corn that John planted were: Golden Giant, 45¢ for 1 lb. or $4.20 for 12 lb.; Stowell's Evergreen, 70¢ for 1 lb. or $6.60 for 12 lb.; Country Gentleman, 45¢ for 1 lb. or $3.96 for 12 lb. John and his friends clubbed together and bought 12 lb. of each of these 3 varieties, each boy taking 1 lb. How much did each boy save per pound on each variety? How much in all did each boy save by clubbing together to buy the 4 varieties of seed? See ex. 1.

3. Each pound of seed corn is enough to plant 400 hills, with 6 kernels of corn in each hill. John learned that he could not expect all 6 kernels of corn to grow but that 3 of them would probably grow, thus giving 3 stalks of corn per hill. John often said this rhyme as he dropped 6 kernels in each hill: "1 for the bug, 1 for the crow, 1 to rot, and 3 to grow." If more than 3 stalks came up in a hill, he pulled out all but 3 to give the stalks room to grow. John also learned that he could expect an average of 1 good ear of corn per stalk. If there were 3 stalks per hill, how many good ears of corn did he expect to get from 400 hills?

4. John planted 4 varieties of corn and had 400 hills of each variety. How many good ears of corn did he expect to get all together during the summer? See ex. 3.

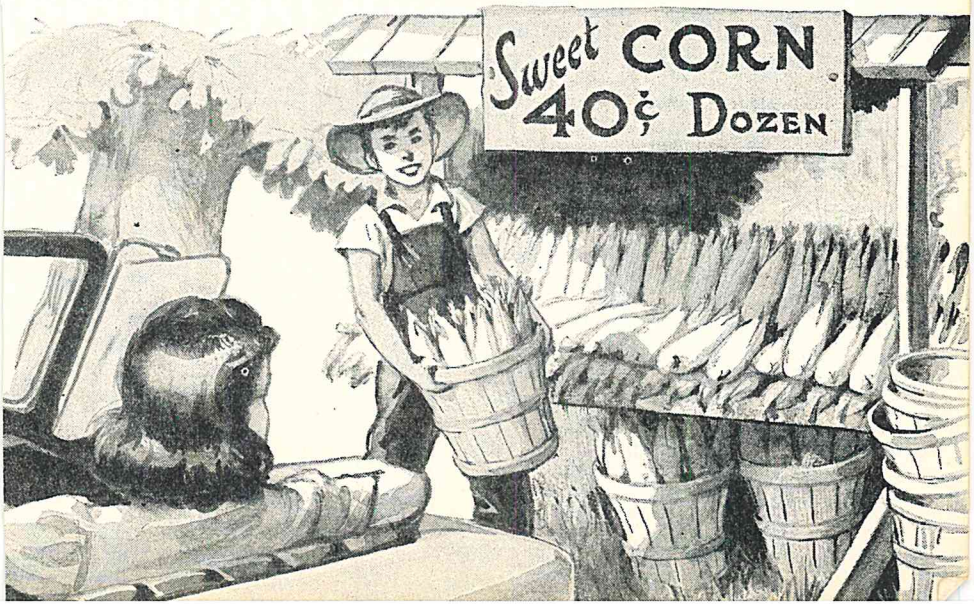
5. One week John sold 984 ears of corn at his road-side stand. How many dozen ears did he sell? How much did he get for this corn at 40¢ per dozen?

6. Another week he sold 1020 ears at 40¢ per dozen. The next week he sold 960 ears at 36¢ per dozen. How much money did John take in during those 2 weeks?

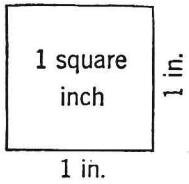
7. The first week in September John sold 942 ears of corn. He sold 348 of these ears at his stand at 36¢ a dozen. He sold the rest of them to the store at 30¢ a dozen. How much in all did he get that week?

8. How many ears of corn did John sell all together during the 4 weeks? See ex. 5 to 7. John gave the rest of the corn he raised to his mother for home use and canning.

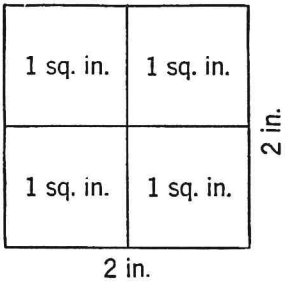
9. Ex. 5 to 7 tell how much money John took in last summer. From ex. 1 and 2 you can find out how much in all John paid out for his seed corn. He also paid out $6.50 for other expenses. How much profit did John make last summer?



1. The figure at the right is a *square*. All 4 sides of a square are the same length. The corners of a square are called *square corners* or *right angles*. Each side of this square represents 1 in. The whole square is 1 *square inch*. You can also say that the square has an *area* of 1 square inch, or 1 sq. in.



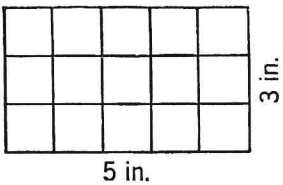
2. Draw and cut out a square that has each side 2 in. long. Fold it, as shown at the right. How many square inches are there in this square? This shows that the area of this square is 4 square inches, or 4 sq. in.



3. If each side of a square is 1 ft. long, it is a *square foot*. The square foot is used to measure large areas like the area of a floor or a garden. The *square inch* is used to measure smaller areas like the area of a sheet of paper, or a post card.

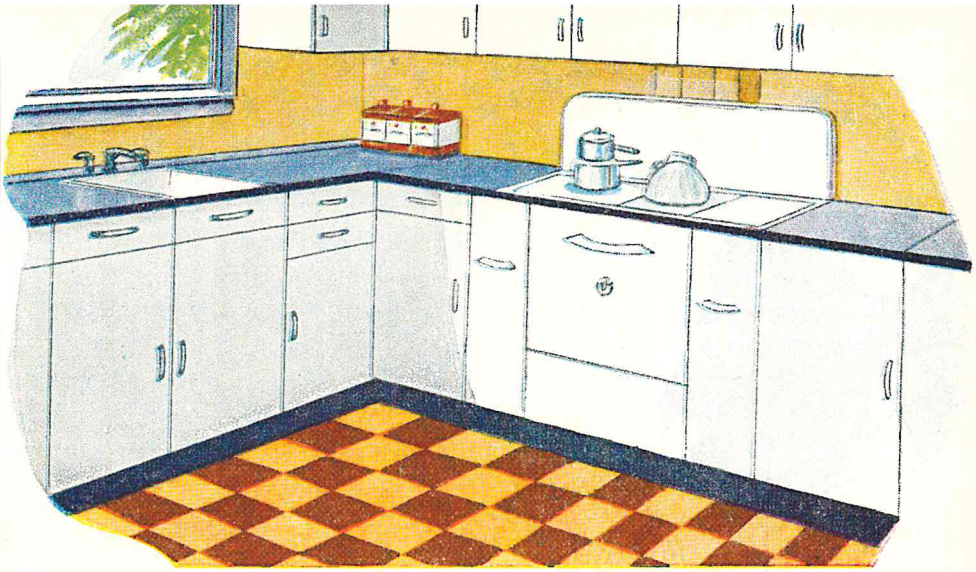
4. This figure is a rectangle. The corners of a rectangle are also *square corners* or *right angles*. How many right angles are there in a rectangle? How many sides has a rectangle? Are the sides of a rectangle all the same length?

5. The figure at the right represents a rectangle 5 in. long and 3 in. wide. If you divide it into square inches, it contains 15 square inches, so its *area* is 15 sq. in.



6. Look for 3 rectangles in your schoolroom.

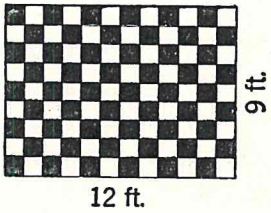
7. Is a tennis court a square or a rectangle? What is the shape of a baseball diamond?



LINOLEUM FOR THE KITCHEN FLOOR

1. Mrs. Bell bought some linoleum for her kitchen floor. The floor is 12 ft. long and 9 ft. wide. How many square feet of linoleum did it take to cover the floor?

The picture at the right shows the whole kitchen floor; it has the shape of a rectangle. Each small square represents 1 sq. ft. You can find the area of the floor by counting the small squares. How many square feet are there in the floor?



A shorter way to find the area of the floor is like this: You see that there are 12 sq. ft. in the top row of the rectangle and that there are 9 rows. So the area is 9×12 sq. ft., or 108 sq. ft. You see that you found the area by multiplying the length, 12, by the width, 9. It took 108 sq. ft. of linoleum to cover the floor.

2. Mrs. Allen has a kitchen that is 15 ft. long and 12 ft. wide. How many square feet of linoleum will it take to cover her floor?

Make a picture of the floor like that for ex. 1. How many square feet are there in 1 row? How many rows are there?

1. Jane's room is 11 ft. wide and 13 ft. long. How many square feet are there in the floor of Jane's room?

2. In ex. 1 the length and width of the room are *both* given in *feet* and the area is found in *square feet.* In finding the area of a rectangle, both the length and the width must be given in the same unit of measure.

> To find the area of a rectangle, multiply its length by its width.

3. Jack's room is 10 ft. by 14 ft. This means that the room is 10 ft. wide and 14 ft. long. Find the area of the floor of Jack's room. Will the area be found in square feet or in square inches?

4. Mary's garden is 6 ft. by $8\frac{1}{2}$ ft. Sally's garden is $5\frac{1}{2}$ ft. by 10 ft. Which garden has the larger area? How much larger is it?

5. Which garden has the larger area, one measuring 20 ft. by 20 ft., or one measuring 18 ft. by 22 ft.?

6. Mr. Fox wants to paint the floor of the front porch of his house. The porch measures 6 ft. by $14\frac{1}{2}$ ft. How many square feet are there in the porch floor? A pint of paint will cover 90 sq. ft. Is 1 pint of paint enough?

Find the areas of these rectangles:

7.	5 ft. by 8 ft.	10 ft. by 12 ft.	$7\frac{1}{2}$ ft. by 9 ft.
8.	7 ft. by 9 ft.	12 ft. by 15 ft.	16 ft. by 17 ft.
9.	$6\frac{1}{2}$ ft. by 8 ft.	11 ft. by 13 ft.	$2\frac{1}{2}$ ft. by 9 ft.
10.	$8\frac{3}{4}$ ft. by 12 ft.	24 ft. by 28 ft.	12 ft. by $12\frac{1}{2}$ ft.
11.	$7\frac{1}{4}$ ft. by 8 ft.	$8\frac{1}{2}$ ft. by 11 ft.	$14\frac{3}{4}$ ft. by 16 ft.
12.	$3\frac{1}{2}$ ft. by 10 ft.	$4\frac{1}{4}$ ft. by 12 ft.	$18\frac{1}{2}$ ft. by 20 ft.

1. A square that measures 1 yd. on each side is called a *square yard.* The square yard is used in measuring areas just as the square foot and the square inch are used in measuring areas.

2. Draw a square yard on a large piece of paper or on the blackboard. You see the square yard is a large unit of measure. The square yard is often used to measure the area of a sidewalk or a floor.

3. Mrs. Smith's kitchen is 3 yd. wide and 4 yd. long. At $1.85 per square yard, how much will it cost to cover the floor with linoleum?

Since the length and the width of the floor are both given in *yards,* the area will be found in *square yards.* How many square yards are there in the area? Find the cost of the linoleum at $1.85 per square yard.

4. Mr. Jones is going to lay a cement sidewalk in front of his house. The walk will be 1 yd. wide and 32 yd. long. How much in all will it cost to lay the walk at $2.35 per square yard?

5. At $1.75 a square yard, what will the linoleum cost for a room 12 yd. by 18 yd.? Another way to write 12 yd. by 18 yd. is 12 yd. × 18 yd. The sign × means "by."

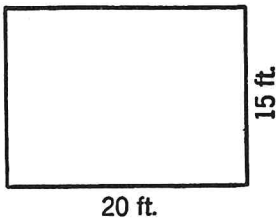
6. Very large areas, such as the area of the United States or the area of a state, are measured in *square miles.* A square mile is a square measuring 1 mi. on each side. The area of Ohio is 41,040 sq. mi. The area of Kansas is 82,158 sq. mi. Is Kansas about twice or three times as large as Ohio?

Find the areas of these rectangles:

7. 3 yd. by 5 yd.	10 yd. by 12 yd.	$3\frac{1}{4}$ ft. × 4 ft.
8. 5 yd. by $6\frac{1}{2}$ yd.	12 yd. by 14 yd.	$5\frac{1}{2}$ yd. × 6 yd.
9. 5 yd. by 5 yd.	14 yd. by 19 yd.	$6\frac{3}{4}$ in. × 8 in.
10. 6 yd. by $8\frac{1}{2}$ yd.	11 yd. by 15 yd.	$8\frac{1}{2}$ mi. × 9 mi.

1. Mary's garden is shaped like a rectangle; it is 15 ft. wide and 20 ft. long. Mary's father has put a wire fence around the garden to keep animals from getting into it. Do you know how many feet of wire netting Mary's father needed for the fence?

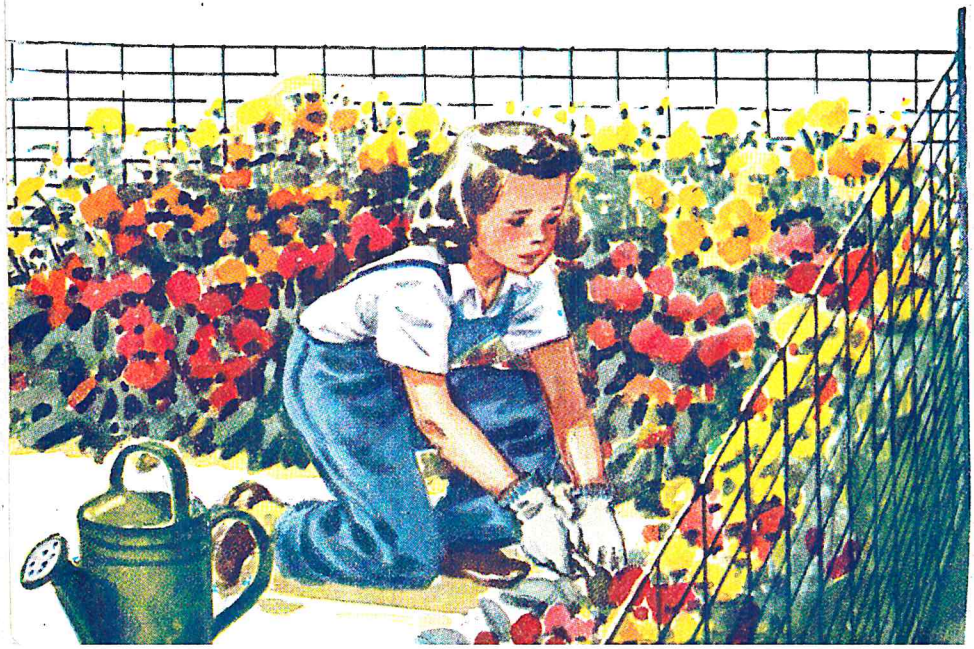
To find how many feet of wire he needed for the fence, you must find the distance around the garden which is 15 ft. + 20 ft. + 15 ft. + 20 ft., or 70 ft. in all. So 70 ft. of wire netting were needed for the fence.



The distance around a rectangle is called its *perimeter*. The perimeter of Mary's garden is 70 ft.

2. Last year Mary had a garden that was 18 ft. wide and 20 ft. long. How many feet of wire netting did it take to make a fence around that garden? What is the perimeter of that garden?

3. Mary's father has a garden 40 ft. by 60 ft. What is the perimeter of his garden?



1. Find the perimeter of a rectangle 6 ft. wide and 8 ft. long; of a rectangle 4 in. wide and 9 in. long.

2. A short way to write 6 ft. is 6′; a short way to write 8 in. is 8″. Find the perimeter of a rectangle measuring 3″ by 7″; of a rectangle measuring 4′ by 6′.

Find the perimeter of rectangles with these measurements:

3. 11 ft. by 18 ft.	8′ by 12′	$4\frac{1}{2}'' \times 6''$
4. 10 in. by 14 in.	7′ by 15′	$7\frac{1}{2}'' \times 8\frac{1}{2}''$

5. Tom has a garden 25 ft. long and 20 ft. wide. Alice has a garden 30 ft. long and 15 ft. wide. Which garden has the larger area? How many square feet larger is it? What is the perimeter of each garden?

6. Bill is planning to make a rabbit pen. He has 40 ft. of wire netting that he can use to put a fence around the pen. Is 40 ft. enough if he makes a square pen 10 ft. by 10 ft.? Is 40 ft. enough if he makes the pen 8 ft. by 12 ft.? Which pen will give the larger area? Does the pen with the larger area give more room for the rabbits?

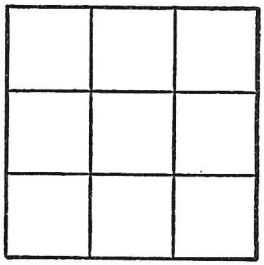
7. Joe is making a chicken yard. The wire netting he wants to buy is sold only in rolls containing 150 ft. How large a yard can he make with 150 ft. of netting? Could the yard be 30′ by 45′? Could it be 25′ by 50′? Could it be 35′ by 40′? Which yard will give the largest area?

8. Mr. Black wants to paint the kitchen floor with 2 coats of paint. The floor is $14\frac{1}{2}$ ft. long and 10 ft. wide. A quart of paint covers 150 sq. ft. with one coat of paint. How many quarts of paint should Mr. Black buy?

Find the areas of rectangles with these measurements:

9. 6 in. by 8 in.	14″ by 16″	$5' \times 12'$
10. 5 ft. by 9 ft.	11″ by 20″	$9' \times 17'$

1. On the blackboard draw a square measuring 1 yd. on each side. Mark off each side in feet. Then draw lines to divide the square into square feet, as shown at the right. Count the number of square feet in the figure. How many square feet are there in 1 square yard?



1 square yard

2. Jack measured the kitchen floor at home. He says it is 9 ft. wide and 12 ft. long. What is the area of the floor in square feet?

3. Jack wants to know how many square yards there are in 108 sq. ft. Dick says he should divide 108 by 9 since there are 9 sq. ft. in 1 sq. yd. The answer is 12. There are 12 sq. yd. in 108 sq. ft.

4. Jack has another way to find the area of the floor in square yards. The kitchen is 9 ft. wide and 12 ft. long. He changes 9 ft. to 3 yd. and 12 ft. to 4 yd. Then he multiplies 4 by 3, which gives 12 as the area in square yards.

5. Jim's father wants a new cement walk from the house to the street. The walk will be 3 ft. wide and 18 ft. long. How many square yards will there be in the walk? What will it cost at $2.15 per square yard?

6. A garden measures 6 yd. by 9 yd. How many square yards are there in the garden? How many square feet?

Tell what numbers to put in the spaces:

7. 10 sq. yd. = . . . sq. ft.	27 sq. ft. = . . . sq. yd.
8. 36 sq. ft. = . . . sq. yd.	30 sq. yd. = . . . sq. ft.
9. 54 sq. ft. = . . . sq. yd.	60 sq. yd. = . . . sq. ft.
10. 18 sq. yd. = . . . sq. ft.	12 sq. ft. = . . . sq. yd.
11. 6 sq. yd. = . . . sq. ft.	18 sq. ft. = . . . sq. yd.

1. On pages 276 and 277 you learned that there are 144 sq. in. in 1 sq. ft. and 9 sq. ft. in 1 sq. yd. Here is the table of square measure. Try to remember it:

144 square inches	=	1 square foot (sq. ft.)
9 square feet	=	1 square yard (sq. yd.)
43,560 square feet	=	1 acre (A.)

2. The acre is a measure for very large areas of land. Farms and large fields are measured by the acre. How many square feet are there in 1 acre?

3. How many square feet are there in $\frac{1}{2}$ acre? in $1\frac{1}{2}$ acres? in $2\frac{1}{4}$ acres?

4. Mr. King has a field 325 ft. long and 200 ft. wide. Is the area of the field *about* 1 acre, $1\frac{1}{4}$ acres, or $1\frac{1}{2}$ acres?

5. Mr. Brown has a piece of land near Park School. He let the boys and girls use it for gardens. The piece of land is square and measures 209 ft. on each side. Is its area close to an acre?

6. Measure your school yard or playground. Is its area more or less than an acre?

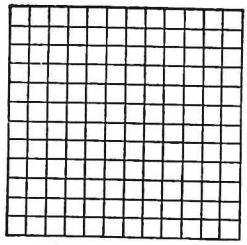
7. Bill's corn field measures 18 ft. by 30 ft. Is Bill's corn field larger than Dick's, which is 24 ft. by 24 ft.?

8. George's father is planning to have a cement floor in his new garage. George says the floor is 15 ft. by 24 ft. It will cost $2.25 a square yard to have the cement floor laid. Find its cost.

9. Mr. Allen bought a farm of 60 acres at $55 an acre. How much did he pay for it?

10. A school baseball field is 355 ft. by 490 ft. How many square feet are there in the field? Does the field contain about $3\frac{1}{2}$ acres or about 4 acres?

1. On a large sheet of paper draw a square measuring 1 ft. on each side. Mark off each side in inches and draw lines as shown at the right. These lines divide the square into square inches. How many square inches are there in 1 row? How many rows are there? How many are 12×12 sq. in.? How many square inches are there in 1 sq. ft.?



1 square foot

2. There are 144 sq. in. in 1 sq. ft. How many square inches are there in 3 sq. ft.? in $\frac{1}{2}$ sq. ft.?

3. Find the area of a rectangle 9 in. long and 8 in. wide. What part of a square foot is this area?

4. Ann has a desk pad 11 in. wide and 1 ft. 3 in. long. Find the area of the pad.

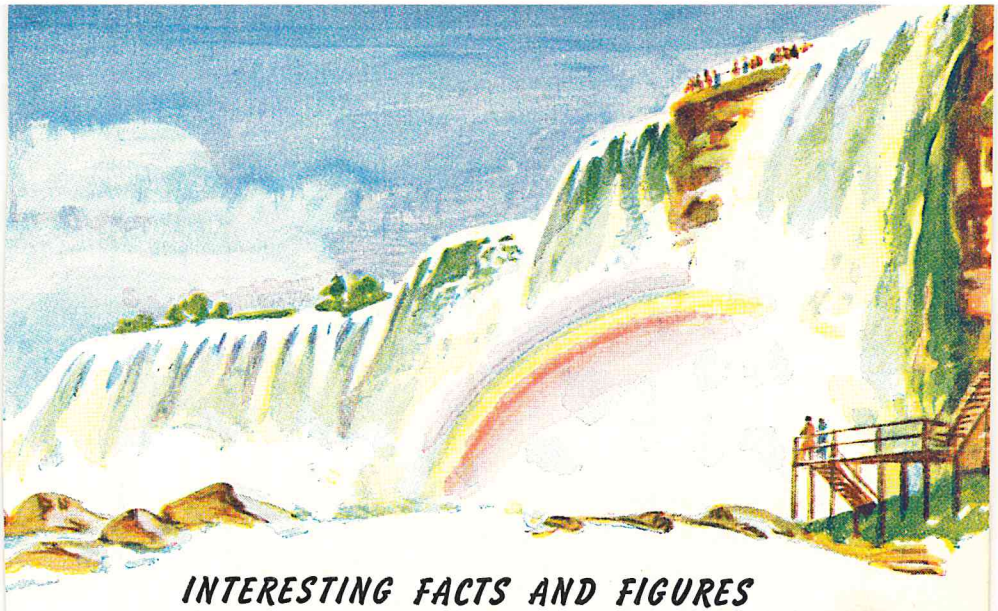
Before finding the area, the length and width must *both* be given in inches, or *both* in feet, or *both* in yards. First change 1 ft. 3 in. to 15 in. Then find 11×15.

5. Mary has a garden 12 ft. long and 9 ft. 6 in. wide. Find its area. First change 9 ft. 6 in. to $9\frac{1}{2}$ ft. Then both the length and the width will be given in feet.

6. John's father wants to lay a new sidewalk 4 ft. wide and 18 yd. long. Find the cost at $2.25 a square yard.

Find the areas of these rectangles. Before multiplying, be sure that the length and the width are both expressed in *inches*, or both in *feet*, or both in *yards:*

7. 2 ft. by 2 yd. — $3\frac{1}{2}$ ft. by 4 ft.
8. 18 in. by 2 yd. — 4 ft. 6 in. by 6 ft.
9. 14 in. by 17 in. — 8 ft. 4 in. by 9 ft.
10. 9 in. by 1 ft. 2 in. — 20 ft. 6 in. by 24 ft.



INTERESTING FACTS AND FIGURES

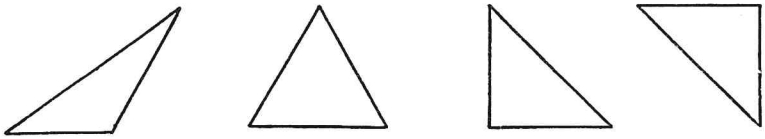
1. Niagara Falls is 167 ft. high. Upper Yosemite Falls in Yosemite Park is 1430 ft. high. Is Upper Yosemite Falls about 8, $8\frac{1}{2}$, or 9 times as high as Niagara Falls?

2. The channel span of Golden Gate Bridge in San Francisco is 4200 ft. long. The channel span of George Washington Bridge in New York is 3500 ft. long. How much longer is the channel span of Golden Gate Bridge than that of George Washington Bridge?

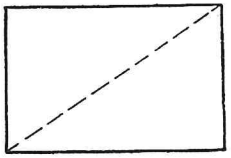
3. The Mississippi–Missouri River is 3988 mi. long. The St. Lawrence River is 1900 mi. long. How much longer is the Mississippi–Missouri River than the St. Lawrence?

4. In Omaha in 1936 the lowest temperature of the year was in January when the thermometer read 21° *below* zero; the highest temperature that year was in July when the thermometer read 114°. What was the difference in degrees between the highest and lowest temperatures that year?

5. In 1938 Howard Hughes flew around the world covering a distance of 14,824 mi. in about 71 hr. of flying time. What was his average speed per hour? Give the answer to the nearest whole mile.

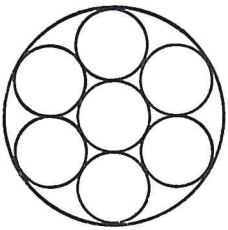


1. The figures above are *triangles*. Every triangle has 3 sides and 3 angles. Sometimes one of the angles in a triangle is a right angle. Which of the triangles above have a right angle?



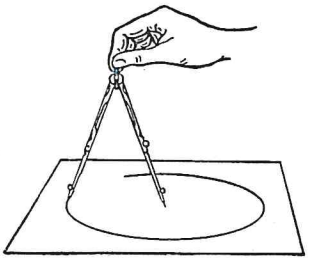
2. Draw a rectangle 3 in. long and 2 in. wide. Draw a line in the rectangle to divide it into two triangles as shown at the right. Do these triangles each have a right angle?

3. Try to find a picture in a newspaper or magazine that shows one or more triangles. Pictures of buildings and bridges often have triangles in them.



4. How many circles can you see in the picture at the left? Be sure to find all of them.

5. Do you know how to draw a circle on the blackboard with chalk and a piece of string? Take a piece of string about 15 in. long. Tie the end of it around the middle of a piece of chalk. Your teacher will show you how to hold one end of the string against the blackboard with your left hand while you draw a circle on the board by moving the chalk with your right hand.



6. You can also draw a circle with a pair of compasses as shown at the right. If you have compasses draw 6 circles of different sizes.

7. Name some objects you see every day that are shaped like circles.

Add and check the work:

1.	246	112	685	221	817	744	660
	497	563	336	932	450	477	757
	785	756	597	596	398	385	223
	579	298	958	884	747	467	375
	324	845	173	209	626	616	519
	603	334	411	753	222	631	412

Subtract and check the work:

2.	$5\frac{3}{4}$	$4\frac{3}{16}$	$2\frac{4}{5}$	$3\frac{2}{3}$	$6\frac{5}{6}$	$4\frac{1}{2}$	7
	$4\frac{7}{8}$	$2\frac{1}{8}$	$\frac{7}{10}$	$3\frac{1}{4}$	6	$2\frac{1}{6}$	$4\frac{3}{8}$

Multiply and check the work:

3.	804	670	297	592	348	458	593
	395	728	604	178	287	346	509

4.	6309	2167	7260	5319	405	537
	46	39	75	23	980	460

Divide and check. Write remainders as fractions in the quotients:

5.	$28\overline{)9148}$	$33\overline{)7131}$	$84\overline{)5922}$	$56\overline{)36864}$
6.	$42\overline{)2499}$	$19\overline{)8639}$	$25\overline{)7730}$	$38\overline{)14036}$

Multiply and check. Reduce fractions in answers to lowest terms:

7.	$11 \times \frac{3}{4}$	$\frac{3}{5} \times 25$	$7\frac{1}{2} \times 25$	$16 \times 25\frac{1}{3}$
8.	$1\frac{2}{3} \times 8$	$5 \times 16\frac{3}{8}$	$4\frac{1}{6} \times 20$	$24 \times 15\frac{7}{8}$
9.	$15 \times 2\frac{2}{3}$	$\frac{5}{8} \times 32$	$3\frac{1}{3} \times 24$	$31 \times 73\frac{1}{4}$
10.	$5\frac{1}{2} \times 24$	$3 \times 25\frac{3}{4}$	$2\frac{3}{8} \times 48$	$45 \times 13\frac{1}{2}$
11.	$3\frac{1}{2} \times 11$	$4 \times 33\frac{2}{3}$	$5\frac{1}{2} \times 19$	$6\frac{3}{4} \times 24$
12.	$16 \times 3\frac{1}{8}$	$8 \times 12\frac{1}{2}$	$11 \times 2\frac{1}{3}$	$8\frac{1}{5} \times 14$

1. Count by 6's from 28 to 82; from 93 to 123.

2. Count by 7's from 11 to 60; from 86 to 128.

3. Count by 8's from 17 to 73; from 94 to 134.

4. Count by 9's from 21 to 75; from 86 to 131.

5. How many figures are there in the number *two million?*

6. Say the next three numbers after 999,998.

7. Tell two ways to write five cents.

8. Read these Roman numbers: CCC, XCIX, MCMXC.

9. Find the sum of 3.0 in. and 2.4 in.

10. How many gallons are there in 100 qt. of milk?

11. A bushel of potatoes weighs 60 lb. What part of a bushel is 15 lb.?

12. Count your change from 75¢ if you spend 60¢; from $1.00 if you spend 39¢; from 50¢ if you spend 17¢.

13. How many hours and minutes are there between 10:15 P.M. on Tuesday and 6:30 A.M. on Wednesday?

14. Reduce to lowest terms: $\frac{10}{20}$, $\frac{12}{18}$, $\frac{36}{48}$, $\frac{10}{16}$.

15. Change $\frac{1}{3}$ and $\frac{1}{2}$ to fractions having a common denominator. Then find the sum of the fractions.

16. Using the numbers 3, 5, and 7, or any two of them, make a proper fraction; a mixed number; a mixed decimal; an improper fraction.

17. A rectangle is 10 ft. long and 5 ft. wide. Find its perimeter and its area.

18. Find $\frac{2}{3}$ of each number: 15, 24, 27, 33, 48, 60.

19. Multiply each number by 8: $1\frac{1}{2}$, $2\frac{3}{4}$, $3\frac{5}{8}$, $5\frac{1}{2}$.

20. Change these fractions to fractions having 12 as a common denominator: $\frac{1}{2}$, $\frac{2}{3}$, $\frac{3}{4}$, $\frac{5}{6}$.

21. How many square yards are there in 54 sq. ft.?

1. You know the number of pupils enrolled in each room of your school. How do you find the total number of pupils in the school?

2. You know the number of miles your father drove his car on each of four days. How do you find the average number of miles he drove per day?

3. You know the number of miles the speedometer of the car read before your father went to Chicago. You know the number of miles the speedometer read when he got home. How do you find how many miles he drove?

4. You know the cost of one yard of cloth. You know how many yards of cloth you need. How do you find the cost of all the cloth you need?

5. You know the number of cans of pears you bought and the total price you paid. How do you find the price of one can?

MISSING FACTS

In each problem there is a fact you need to know before you can work the problem. Supply a fact that will make a good problem and then work the problem:

6. George bought a pair of shoes. How much did he have left from $5.00?

7. Alice is 8 years older than her sister Mary Jane. How old is Alice?

8. Bill bought a baseball. Then he had $1.43 left. How much did the baseball cost?

9. Our class spent $3.05 for food for the party. What is each one's share of the cost of the food?

10. It took Jack and his father 3 hr. to drive to Philadelphia. How many miles per hour did they average?

Add up. Check the work by adding down:

1.	2054	4449	3507	7530	3397	1460
	3549	1538	2126	2361	8141	5903
	4676	2057	3368	1186	6876	4297
	1802	2123	1423	5215	4508	7999
	7636	2663	3402	4224	4527	4419

Subtract. Check by adding:

2.	$507.37	$600.00	$914.98	$175.97	$612.96
	404.59	223.46	259.93	85.66	315.79
3.	$158.14	$328.83	$130.54	$100.50	$529.48
	74.48	143.89	39.56	80.88	264.58

Multiply. Check by interchanging the numbers:

4.	718	904	360	86	427	527
	459	873	216	500	250	367
5.	346	681	935	37	705	492
	972	638	342	800	190	541

Divide. Check by multiplying:

6.	23)897	69)2622	56)4760	21)43235	46)41599
7.	41)902	81)6649	29)1363	68)44437	24)20996
8.	35)945	22)1210	30)1736	25)12025	18)17154
9.	40)857	66)6295	24)2381	59)16419	20)21340
10.	21)825	47)1370	77)4774	47)22579	48)24395
11.	32)896	23)2047	36)2441	15)12480	79)24278

1. Take the test on the 100 addition facts on page 4.

Copy, add, and check:

2. \$596.25 + \$464.76 + \$548.98 + \$357.57 + \$213.02
3. \$230.46 + \$ 88.08 + \$347.94 + \$ 18.57 + \$101.59
4. \$431.26 + \$596.37 + \$748.99 + \$175.84 + \$ 57.41
5. \$222.82 + \$181.67 + \$ 98.45 + \$139.16 + \$ 74.09
6. \$436.58 + \$ 63.30 + \$249.12 + \$ 14.76 + \$655.66
7. 9689 + 5573 + 6716 + 1265 + 2384
8. 4334 + 5658 + 8766 + 6481 + 6107
9. 2009 + 1775 + 5830 + 7221 + 4379
10. 5347 + 8000 + 9040 + 8374 + 6239

Add and check the work:

11.

15	17	40	12	50	32	54
64	74	67	26	79	38	13
78	35	58	95	21	29	76
26	97	32	37	88	63	32
49	89	94	44	63	42	41
81	50	39	51	37	15	25
62	42	26	13	36	51	56

12.

123	442	194	366	131	336	226
552	855	416	443	747	273	392
484	590	908	927	686	842	657
949	336	261	159	229	657	840
211	178	540	772	565	408	578
276	423	377	272	614	569	405

13.

748	123	396	389	549	541	357
484	265	821	255	398	217	945
969	830	287	716	935	370	498
310	689	754	447	101	969	721
233	678	435	647	467	736	233

1. Take the test on the 100 subtraction facts on page 10.

Subtract and check the work:

2.	718	982	4700	4382	51968
	352	733	3686	1579	48573
3.	683	501	9667	6815	37000
	293	126	792	6426	22437
4.	847	495	2432	6436	80214
	769	28	835	3592	50738
5.	373	952	9293	5194	41050
	157	764	1688	3735	12569
6.	848	715	9138	8667	72707
	351	246	4579	4791	36741

7. Take the test on page 4 using it as a test on the multiplication facts.

Multiply and check the work:

8.	58	79	645	937	6039	7180
	16	38	290	406	35	47
9.	64	48	485	375	2194	2809
	69	52	380	209	27	59
10.	75	70	362	806	1609	4286
	54	31	780	268	93	84
11.	64	53	709	475	8045	2095
	47	17	860	259	37	41
12.	38	93	254	694	2370	1263
	29	74	630	204	63	85

1. When you tell the distance you rode your bicycle this week you give it in *miles;* here the *unit of measure* is the *mile.* When you find the length of the schoolroom you measure it in *feet* or *yards;* in this case the mile would not be a convenient unit of measure because it is too large. Always use the unit of measure that is the most convenient.

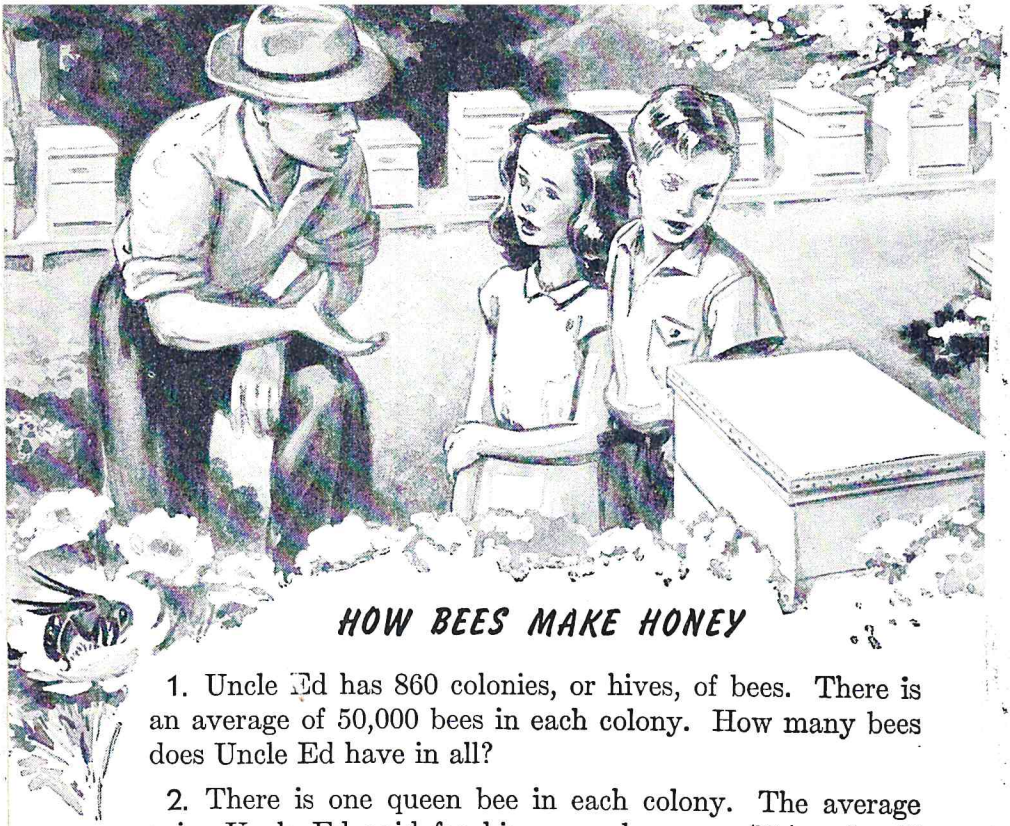
2. To measure time the units are the *second, minute, hour, day, week, month, and year.* Short periods of time are measured by the first four units and longer periods by the last three. There are also different units for measuring weight such as the *ounce,* the *pound,* and the *ton.* Name some units for measuring liquids.

3. What unit of time is used to tell how old you are? to tell how long it takes you to ride to school? to tell how long you sleep at night?

4. What unit of weight is used to measure the weight of an elephant? the weight of a boy? the weight of a small candy bar? the weight of a small box of books?

Tell the unit of measure you should use to find:

5. The length of a rug.
6. The weight of a truck.
7. The time you practice.
8. The weight of a letter.
9. The time to run 25 yd.
10. The height of a doll.
11. The weight of coal your father buys.
12. The distance a train travels in 6 hr.
13. The time school is closed for summer vacation.
14. The amount of milk you drink in a year.
15. The number of rolls you buy at the bakery.
16. The amount of cloth you need for a dress.
17. The length and width of the cover of a book.
18. The weight of a chicken that you buy.



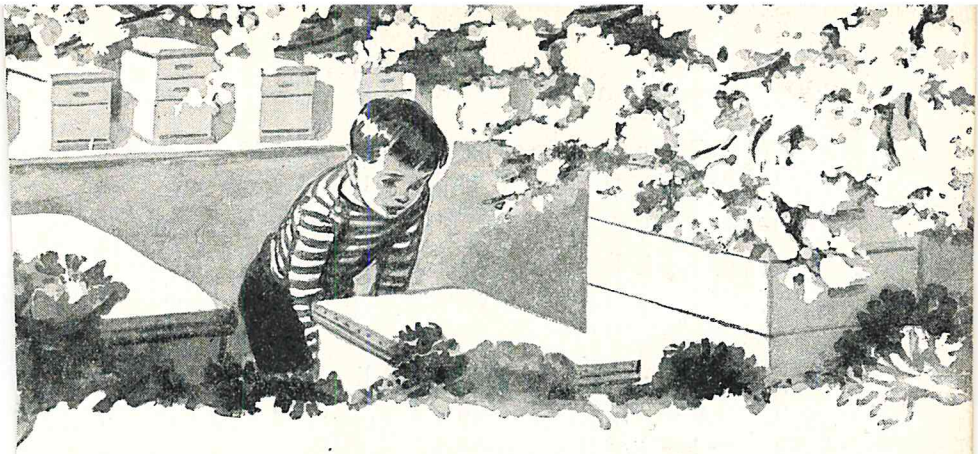
HOW BEES MAKE HONEY

1. Uncle Ed has 860 colonies, or hives, of bees. There is an average of 50,000 bees in each colony. How many bees does Uncle Ed have in all?

2. There is one queen bee in each colony. The average price Uncle Ed paid for his queen bees was 75¢ each. If Uncle Ed bought a new queen bee for each of his colonies, what did the 860 queens cost?

3. During the months when flowers are in bloom, about $\frac{2}{5}$ of the bees work inside the hive, while the rest of the bees work outside the hive gathering nectar from the flowers. In a colony of 50,000 bees, how many bees are working inside the hive? outside the hive?

4. Ex. 3 shows that 30,000 bees of each colony work outside the hive. On a single trip each bee brings a tiny amount of nectar to the hive. When the tiny amounts brought by each of 30,000 bees are added up, it is found that these bees bring a total of 3 lb. of nectar to the hive on each trip. If the bees make 4 trips a day, how many pounds of nectar are brought to the hive in a day?



5. After the day's work of bringing nectar to the hive is over, the bees start the work of changing the nectar into honey. Each bee fills her mouth with a drop of nectar and begins a chewing motion which lasts several minutes. After the nectar has been chewed, the bees put it into the wax cells in the honeycomb. This nectar is very watery so the next step is to remove the water from it. To do this the bees fan their wings furiously 400 times a second. At this rate how many times does a bee fan its wings in 1 minute? in 1 hour?

6. The nectar which the bees put into the cells of the honeycomb is $\frac{3}{4}$ water and $\frac{1}{4}$ honey. See ex. 5. If the bees gather 12 lb. of nectar a day, how many pounds of honey do they get from 12 lb. of nectar? How many pounds of water do the bees remove from 12 lb. of nectar by fanning their wings?

7. Uncle Ed says that each colony, or hive, must produce about 420 lb. of honey if he is to make a profit. If one hive makes 3 lb. of honey a day, how many days will it take to make 420 lb. of honey? Uncle Ed takes $\frac{1}{3}$ of the 420 lb. of honey made by each hive; the rest of the honey is eaten by the bees, or stored by them to be eaten in winter. How many pounds of honey does Uncle Ed get per hive? How many pounds of honey do the bees eat per hive?

8. Last year Uncle Ed made an average profit of $5 from each of his 860 hives. What was his total profit last year?

1. Mr. Green averages 32 mi. an hour when he takes a trip in his car. He has to make a trip of 272 mi. About how many hours will it take him to make that trip?

2. Last week Peter earned $1.75. This week he said he earned $.15 more than last week. How much did Peter earn this week?

3. Tom weighs $88\frac{1}{4}$ lb. This is $5\frac{1}{4}$ lb. more than the average weight for boys of Tom's age. What is the average weight for boys of that age?

4. Jack bought a roll of camera film for $.36. He paid $.12 to have the film developed and $.40 for prints of the pictures. If there were 8 prints in all, find the total cost of each print.

5. For the party we bought 3 qt. of ice cream at $.65 a quart and $2\frac{1}{2}$ doz. cookies at $.30 a dozen. How much in all did these things cost?

6. Jane paid $.52 all together for 2 lb. of peas, a head of lettuce, and a bunch of carrots. Her mother wanted to know the price of each article. Jane said she paid $.15 for the lettuce and $.08 for the carrots. She did not remember the price of the peas. Find the cost of the peas per pound.

7. At 25¢ a book, how many books can be bought for $12.00? for $18.00?

8. At 3 for 1¢, how many marbles can Jim get for 15¢?

9. Tom will sell his old bicycle to Joe for $13.50 and let Joe pay for it by making weekly payments of 75¢ each. How many weeks will it take Joe to pay for the bicycle? Change $13.50 to cents.

10. John wants an overcoat that costs $27.65. He has earned $8.25. On his birthday he received $5.00. How much more does he need to buy the overcoat?

11. Find the average of 16 lb., 14 lb., 20 lb., and 18 lb.

Here are three sets of division examples. If you get all the examples right in the first set, you do not need to do the other two sets. If you need more practice, do Sets II and III.

Set I

Divide and check the work:

1.	39)860	67)3484	16)3728	48)25471	24)16608
2.	18)846	32)1472	35)2765	52)33956	68)27336
3.	62)585	29)5900	20)1635	34)29245	27)21426
4.	57)410	13)3600	59)1003	73)36208	66)44946
5.	55)980	82)1437	91)4965	36)22968	25)19263

Set II

6.	42)970	25)1600	43)3140	58)26622	21)18501
7.	51)643	38)3040	67)6057	28)19292	89)40851
8.	19)963	32)2176	15)5000	76)58155	23)15894
9.	37)750	40)6217	69)5552	41)19150	99)71195

Set III

10.	28)741	58)5394	30)8106	96)28512	19)10982
11.	25)650	14)4564	59)4484	41)13243	24)14232
12.	64)927	56)1527	25)1831	77)73959	38)10564
13.	29)885	33)1756	87)6154	24)17784	63)52763

Add. Check the work by going over it:

1.	$\frac{5}{8}$	$1\frac{3}{4}$	$12\frac{7}{10}$	4	$4\frac{5}{6}$	$20\frac{7}{10}$
	$\frac{1}{2}$	$2\frac{3}{4}$	$10\frac{1}{2}$	$6\frac{7}{8}$	$4\frac{5}{6}$	$11\frac{3}{5}$
2.	$\frac{5}{12}$	$4\frac{3}{8}$	$23\frac{7}{12}$	$9\frac{2}{3}$	$7\frac{1}{2}$	$18\frac{5}{6}$
	$\frac{1}{6}$	$6\frac{3}{8}$	$10\frac{1}{6}$	$\frac{3}{4}$	$2\frac{1}{3}$	19
3.	$\frac{7}{16}$	$2\frac{1}{2}$	$11\frac{3}{10}$	$4\frac{1}{2}$	$9\frac{5}{12}$	$11\frac{11}{16}$
	$\frac{5}{16}$	$3\frac{5}{6}$	$5\frac{1}{10}$	$8\frac{1}{3}$	$1\frac{3}{4}$	$10\frac{5}{8}$
	$\frac{11}{16}$	$1\frac{2}{3}$	$12\frac{1}{10}$	$2\frac{1}{3}$	$6\frac{1}{2}$	$16\frac{1}{2}$

Subtract. Check the work by going over it:

4.	1	$2\frac{3}{4}$	$10\frac{1}{3}$	$6\frac{5}{12}$	$9\frac{5}{8}$	$70\frac{1}{2}$
	$\frac{3}{4}$	$1\frac{1}{4}$	$9\frac{1}{2}$	$4\frac{2}{3}$	$6\frac{3}{16}$	$45\frac{5}{6}$
5.	7	$9\frac{1}{2}$	$12\frac{5}{12}$	$6\frac{5}{6}$	$8\frac{3}{4}$	$25\frac{1}{16}$
	$\frac{2}{3}$	$4\frac{7}{10}$	$10\frac{7}{12}$	$3\frac{1}{6}$	$2\frac{1}{3}$	$17\frac{9}{16}$
6.	$8\frac{1}{2}$	$7\frac{1}{4}$	$20\frac{7}{10}$	8	$4\frac{9}{16}$	$31\frac{2}{3}$
	$2\frac{5}{16}$	$1\frac{2}{3}$	$15\frac{2}{5}$	$4\frac{7}{8}$	$3\frac{3}{16}$	$19\frac{1}{3}$
7.	$6\frac{2}{3}$	$9\frac{7}{12}$	$38\frac{3}{8}$	$5\frac{1}{10}$	$3\frac{9}{10}$	$20\frac{7}{8}$
	$4\frac{1}{2}$	$6\frac{1}{4}$	$15\frac{3}{4}$	$2\frac{9}{10}$	$3\frac{1}{5}$	$19\frac{1}{4}$

Write in columns and find the answers:

8.	$\frac{4}{5} + \frac{9}{10}$	$2\frac{1}{2} - 1\frac{4}{5}$	$\frac{2}{3} + \frac{5}{6} + \frac{7}{12}$
9.	$\frac{9}{16} - \frac{1}{16}$	$3\frac{1}{2} - 2\frac{3}{4}$	$1\frac{3}{4} + 2\frac{1}{2} + 5\frac{3}{8}$
10.	$\frac{7}{8} + \frac{3}{4}$	$4\frac{5}{8} - 2\frac{11}{16}$	$2\frac{5}{16} + 3\frac{3}{8} + 4\frac{1}{16}$
11.	$\frac{1}{2} + \frac{1}{6}$	$2\frac{3}{4} + 1\frac{1}{3}$	$6\frac{3}{4} + 2\frac{1}{2} + 4\frac{3}{4}$
12.	$\frac{11}{12} - \frac{5}{12}$	$3\frac{11}{12} + 2\frac{7}{12}$	$1\frac{1}{6} + 4\frac{1}{6} + 3\frac{5}{12}$

1. Grace spends 28 min. every school day riding to school and back home on the bus. How many hours does she spend on the school bus in 5 school days?

2. Jack's mother bought $\frac{3}{4}$ lb. of chopped meat at \$.40 a pound and $\frac{1}{2}$ lb. of bacon for \$.19. How much change did she get from \$1.00?

3. George and his father went fishing. They caught 3 fish. One weighed $2\frac{1}{2}$ lb., another weighed $1\frac{3}{4}$ lb., and the third, $\frac{7}{8}$ lb. How many pounds of fish did they have in all?

4. A fast train travels 45 mi. an hour. At that rate, how far will it travel in 12 hr.?

5. Ann buys her lunch at school. Last week she spent these amounts for lunch: 18¢, 23¢, 17¢, 20¢, 17¢. What was the average amount she spent per day?

6. Our class promised to raise \$50.00 for vacation playgrounds. The school year is nearly over and we now have \$48.37. How much more money do we need to raise?

7. An airplane traveled 2400 mi. in 15 hr. How many miles an hour did it average?

8. In a recent year 46.33 in. of rain fell in the city of New York. In that same year 22.39 in. of rain fell in San Francisco. How much less rain fell in San Francisco than in New York?

9. Grace wants a camera that costs \$3.85. She can save \$.35 a week. How many weeks will it take Grace to save enough to buy the camera?

10. Henry wants to put a fence around his chicken yard. The yard is 6 ft. by 18 ft. How many feet of wire netting does he need to buy for the fence?

11. Mr. Bates reached the railroad station $\frac{3}{4}$ hr. before train time. The train was due to leave at 4:17 P.M. At what time did he reach the station?

YES OR NO?

Read each statement. Then tell whether it is right or wrong by saying "yes" or "no":

1. 27 in. is the same as $\frac{3}{4}$ yd.
2. The sum of $2\frac{1}{4}$ and $1\frac{1}{4}$ is $3\frac{2}{8}$.
3. The year 1942 was a leap year.
4. The number $3\frac{7}{8}$ is a mixed decimal.
5. The product of 20 and 160 is 3200.
6. The Roman number MCMXXXIX means 1839.
7. $8\frac{3}{4}$ is the same as $7\frac{14}{8}$.
8. 10,000 ft. is more than 2 mi.
9. The average of 9, 4, 6, and 5 is 6.
10. The cost of $14\frac{1}{2}$ ft. of rope at 2¢ a foot is 32¢.
11. The fraction $\frac{12}{16}$ is equal to the fraction $\frac{3}{4}$.
12. A candy bar weighing $1\frac{3}{4}$ oz. weighs less than $\frac{1}{8}$ lb.
13. In the fraction $\frac{3}{8}$, 8 is the numerator and 3 is the denominator.
14. The value of 8 dimes, 2 quarters, and 7 nickels is $1.65.
15. When 3 apples are divided equally among 4 girls, each girl gets $1\frac{1}{3}$ apples.
16. If the scale on a map is 1 in. = 5 mi., a line 3 in. long on the map represents a distance of 15 mi.
17. Grace lives in a house that was built in 1750. The house is nearly 3 centuries old.
18. These three fractions are all equal: $\frac{6}{8}$, $\frac{12}{16}$, and $\frac{24}{32}$.
19. A good estimate of the total cost of 24 books at $1.98 each is $48.00.
20. The area of a flower garden 12 ft. long and 9 ft. wide is 108 sq. ft., or 12 sq. yd.
21. The perimeter of the garden in ex. 20 is 21 ft.

1. Alice earns 35¢ an hour taking care of children. Yesterday she worked $2\frac{3}{4}$ hr. How much did she earn?

2. Elizabeth's mother wants to make 6 new dish towels. She asked Elizabeth to find out how many yards of toweling she should buy, allowing $\frac{7}{8}$ yd. for each towel. What answer should Elizabeth give her?

3. How much will $\frac{3}{4}$ yd. of silk cost at $2.50 a yard?

Multiply. Check the work by going over it:

4. $9 \times \frac{3}{5}$	$\frac{3}{4}$ of 25	$2\frac{1}{2} \times 26$	$\frac{2}{3} \times 27$	$6 \times 18\frac{1}{2}$
5. $\frac{2}{3} \times 8$	$\frac{7}{8}$ of 40	$4\frac{3}{8} \times 6$	$\frac{3}{10} \times 25$	$8 \times 12\frac{2}{3}$
6. $\frac{4}{5} \times 10$	$\frac{2}{3}$ of 50	$3\frac{3}{4} \times 9$	$\frac{5}{8} \times 96$	$4 \times 25\frac{1}{6}$
7. $7 \times \frac{3}{4}$	$\frac{5}{6}$ of 36	$5\frac{2}{3} \times 12$	$\frac{3}{4} \times 35$	$7 \times 19\frac{3}{4}$
8. $5 \times \frac{4}{5}$	$\frac{3}{5}$ of 80	$7\frac{1}{8} \times 24$	$\frac{5}{6} \times 72$	$3 \times 42\frac{1}{2}$
9. $8 \times \frac{5}{6}$	$\frac{5}{8}$ of 72	$9\frac{1}{6} \times 6$	$\frac{1}{2} \times 98$	$5 \times 34\frac{3}{8}$

Multiply. Check the work by going over it:

10. $35\frac{2}{3}$	$42\frac{1}{2}$	$62\frac{3}{4}$	$57\frac{1}{6}$	$75\frac{1}{8}$	$16\frac{1}{3}$
16	18	8	12	24	8
11. 15	36	75	40	28	52
$4\frac{1}{3}$	$2\frac{3}{4}$	$6\frac{1}{5}$	$16\frac{2}{3}$	$35\frac{1}{2}$	$23\frac{1}{6}$
12. $.25	$.65	$.50	$2.00	$1.75	$2.30
$5\frac{1}{2}$	$2\frac{3}{4}$	$3\frac{1}{8}$	$5\frac{1}{3}$	$12\frac{1}{2}$	$2\frac{5}{6}$
13. $.30	$.45	$.85	$3.75	$2.69	$1.48
$6\frac{2}{3}$	$3\frac{3}{8}$	$7\frac{1}{2}$	$4\frac{1}{2}$	$3\frac{5}{8}$	$2\frac{3}{4}$
14. $.48	$.72	$.45	$1.85	$2.18	$3.25
$12\frac{1}{2}$	$16\frac{1}{3}$	$13\frac{1}{5}$	$14\frac{1}{8}$	$21\frac{3}{4}$	$45\frac{1}{2}$

1. Betty is $48\frac{1}{2}$ in. tall and her sister Sally is $52\frac{1}{4}$ in. tall. What is the difference in their heights?

2. Miss Smith told us that the 28 new history books for our class cost $37.80. What was the cost of each book?

3. Mr. Blue wants to plant 16 rows of tomato plants. He is going to put 27 plants in each row. How many dozen tomato plants should he buy?

4. Fred has a garden 6 ft. by 15 ft. Joe's garden is $7\frac{1}{2}$ ft. by 10 ft. Which boy's garden has the larger area? How much larger is it?

5. Mr. Carter says he averages 19 mi. per gallon of gasoline. If he has a tank full of gasoline, or 15 gal., about how far can he drive on this amount of gasoline?

6. Helen's mother needs 27 in. of cloth to finish Helen's dress. How much will the cloth cost at $.89 a yard?

7. Bill ran the 50-yard dash in $9\frac{1}{5}$ sec. John ran it in $8\frac{1}{2}$ sec. How much less time did it take John than Bill?

8. Mary and Alice bought a plant and a half dozen roses for their mother on Mothers' Day. The plant cost $.80 and the roses were $3.00 a dozen. What was each girl's share of the total cost?

9. Dick's father had 350 hens last fall. During the winter he sold some. Now he has 185 left. How many hens did Dick's father sell?

10. Mr. Brown used 23 gal. of gasoline on a trip of 483 mi. How many miles per gallon did he average?

11. Mrs. Wilson bought a steak weighing 2 lb. 6 oz. It cost 48¢ a pound. How much did she pay for the steak? First change 6 oz. to a fraction of a pound.

12. At the store Sally bought $\frac{3}{4}$ lb. of American cheese and $\frac{1}{2}$ lb. of cream cheese. How much cheese did Sally buy?

1. Jim is now 51 in. tall. He says he has grown $2\frac{3}{4}$ in. since school began in September. How many inches tall was Jim in September?

2. Mr. Green has a fruit store. Last week he bought a box of 150 oranges for \$5.25. He sold the oranges at \$.60 a dozen. How much did he make on the box of oranges?

3. For his birthday Jim got \$2.00 which he wants to spend for films for his camera. How many rolls of film at \$.27 each can he buy?

4. Mrs. Bell's bill for electricity for March was \$4.65. That was about how much, on the average, per day?

5. Ann's older sister earns \$2100 a year. How much a month does she earn?

6. A garden is 30 ft. long and 25 ft. wide. How many square feet are there in its area? How many feet are there in its perimeter?

7. Arthur bought an overcoat that had a regular price of \$15.00. The price was reduced $\frac{1}{4}$. How much did Arthur pay for the overcoat?

8. Find the cost of a chicken weighing 4 lb. 6 oz. at a price of 48¢ a pound.

9. To make a pan of fudge Ann uses 1 lb. of sugar at 7¢ a pound, $\frac{1}{8}$ qt. of milk at 16¢ a quart, 2 oz. of chocolate at 40¢ a pound, and butter and vanilla worth 4¢. Find the cost of the materials for a pan of fudge.

10. Bill's father wants to make a trip of 400 mi. in his car. He knows the car averages about 16 mi. to a gallon of gasoline. About how many gallons of gasoline will he need for the trip?

11. When Mary counted the money she saved last month she had 3 half dollars, 7 quarters, 11 dimes, and 9 nickels. How much money did Mary save last month?

1. In a timetable the distance from Chicago to Westland is given as 48.3 mi. How many miles is the trip from Chicago to Westland and return?

2. At one gasoline station the price of gasoline is 21.3¢ per gallon. At another station the price is 19.8¢ per gallon. What is the difference in the prices at these two stations?

3. One day in March Tom read in the paper that 14.6 in. of snow fell in the mountains. That same day only 0.2 in. of snow fell in the town where Tom lives. How many more inches of snow fell in the mountains than in the town?

Add and check the work:

4.	8.6	63.8	5.09	32.34	268.4	19.18
	2.9	10.4	7.19	19.11	615.7	72.37
	1.4	54.6	4.11	6.38	121.5	17.29
5.	4.7	54.7	7.80	18.07	142.8	40.07
	4.2	27.1	3.95	5.46	652.0	48.28
	7.3	51.6	2.16	2.51	376.5	45.94
	9.1	39.6	4.48	10.50	195.8	53.18
6.	3.4	30.6	2.40	12.31	201.5	20.33
	9.1	83.4	3.05	20.37	445.0	14.38
	4.0	29.7	4.29	1.65	213.9	55.48
	2.6	83.8	3.48	37.29	734.2	14.16

Subtract and check the work:

7.	9.5	78.7	5.97	62.54	468.6	10.71
	4.9	68.3	3.08	28.79	444.7	4.47
8.	6.2	81.4	4.23	79.36	285.3	38.07
	4.4	34.8	2.59	77.79	260.1	21.59
9.	6.3	59.6	4.94	10.00	805.8	80.14
	1.7	42.6	2.26	7.63	624.9	20.75

Tell the numbers in each problem that are not needed to find the answer. Then solve the problem:

1. Mrs. Brown paid $.28 for 5 lb. of potatoes, $.15 for 2 bunches of carrots, and $.13 a pound for 2 lb. of bananas. How much did all these things cost?

2. Mr. Jones had to go to Albany by car. The distance is about 150 mi. He bought 12 gal. of gasoline at $.23 a gallon. How much did the gasoline cost?

3. Mary is $4\frac{1}{2}$ ft. tall and weighs 70 lb. Betty is 4 ft. tall and weighs 55 lb. Find the difference in their weights.

4. Ann bought 2 lb. of coffee for her mother for $.53. How much change did she get from $1.00?

5. Jack is planning a party for his birthday. Ice cream costs $.65 a quart. If he allows 1 qt. to 5 persons, how many quarts will he need to buy for 15 persons?

THE LANGUAGE OF ARITHMETIC

In ex. 6 to 13 show that you know what each word means by using it in a sentence or by giving an illustration:

6. decimal
7. mixed decimal
8. fraction
9. average
10. area
11. square
12. perimeter
13. rectangle

14. What is the area of a rectangle 4 in. by 9 in.?
15. What is the area of a square having each side 6 in.?
16. What is the perimeter of the rectangle in ex. 14?
17. What is the perimeter of the square in ex. 15?
18. What is the average of 19, 26, 18, 20, and 27?
19. Write an improper fraction using the numbers 5 and 12.

1. Which garden has the greater area, one that is 10 ft. by 10 ft. or one that is 8 ft. by 12 ft.?

2. Jack went to the bus station to meet his father at 4:47 P.M. He had to wait until 5:28 P.M. for the bus to come in. How many minutes late was the bus?

3. Mrs. White bought a chicken weighing 4 lb. 10 oz. at 40¢ a pound. Find the cost of the chicken.

4. Tom says he is 4 ft. 10 in. tall. Bill says he is 63 in. tall. Which boy is taller? how much taller?

5. How many feet are there in 1 mi.? in $5\frac{1}{2}$ mi.? Which airplane flew higher, one that flew $5\frac{1}{2}$ mi. high or one that flew 29,775 ft. high?

6. Henry picked 20 qt. of apples. What part of a bushel of apples did Henry pick?

7. An airplane flew 135 mi. in 45 min. What was the speed of the airplane per minute? At this rate, what was the speed of the airplane per hour?

8. Mr. Bates has a new cement sidewalk $3\frac{1}{2}$ ft. wide and 90 ft. long. Find the cost of laying the sidewalk at $2.50 a square yard.

9. How many feet of wire netting are needed to enclose a garden which is 45 ft. long and 28 ft. wide? Would a roll of wire 150 ft. long be enough?

10. It is 660 ft. around the running track on the school playground. What part of a mile is it around this track? How many times must Jack run around it to run 1 mi.?

11. Last week on different days Peggy practiced these numbers of minutes on the piano: 35 min., 45 min., 30 min., 40 min., 25 min., 50 min. How many hours did Peggy practice last week?

12. Betty lives in the country 3 months every summer. What part of a year does Betty live in the country?

Addition Test

Add. Write the answers on folded paper: Time: 4 min.

1.	18	13	82	43	32	67	11	77
	34	74	27	67	15	25	70	15
	88	58	64	56	34	64	49	10
	42	63	52	89	46	95	40	98
	66	97	76	85	83	24	79	61
	13	32	32	21	95	30	52	99
	32	14	75	63	25	47	62	38

Subtraction Test

Subtract. Write the answers on folded paper: Time: 4 min.

2.	13828	32394	18655	42095
	5598	17976	13053	25219
3.	70000	47198	17142	73669
	30248	37239	8575	55886
4.	24345	75003	10000	66628
	21686	56894	8357	50091

Multiplication Test

Copy and multiply: Time: 4 min. after copying.

5.	4982	1756	3609	6375	2894
	83	29	17	58	64

Division Test

Copy and divide: Time: 8 min. after copying.

6.	36)19836	17)14635	41)37094	25)19850
7.	69)55726	83)17928	74)20000	47)40507

1. Find the area and perimeter of a rectangle 4′ by 9′.

2. Which has the larger area, a rabbit pen 5 ft. wide and 9 ft. long or one 6 ft. wide and 8 ft. long? how much larger?

3. Mr. Cole built a cement walk 3 ft. wide and 27 ft. long. How much did it cost him to make the walk at \$2.35 per square yard?

4. Bob's room is $10\frac{1}{2}$ ft. wide and 14 ft. long. How many square yards are there in the surface of the floor?

5. What is the shape of the door of your classroom?

6. Mrs. Brown's kitchen floor is 15 ft. wide and 18 ft. long. How many square yards of linoleum will it take to cover the floor?

7. Tony sells fruit. He charges 10¢ for 3 pears. How much will he charge for 6 pears?

8. How much will $\frac{7}{8}$ yd. of cloth cost at \$2.35 a yard?

9. What is the average speed per hour of a train that travels 755 mi. in 17 hr.?

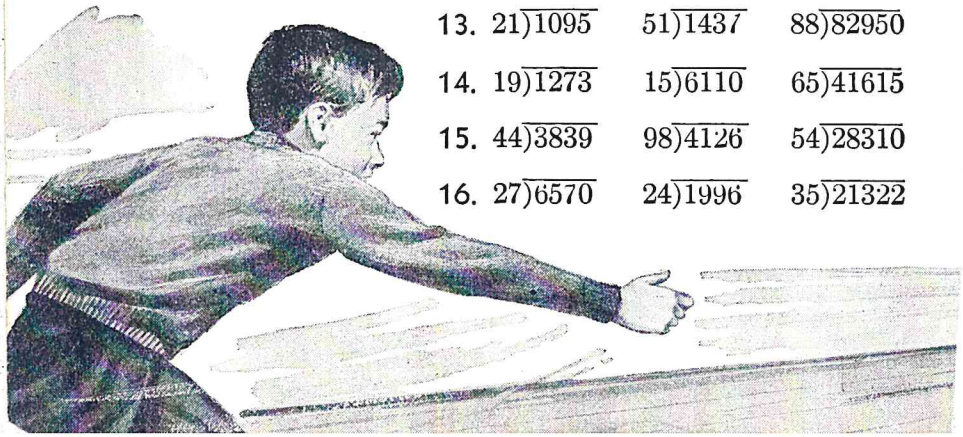
10. Find the sum of $3\frac{3}{4}$, $2\frac{2}{3}$, and $1\frac{1}{2}$. Subtract $3\frac{1}{2}$ from $4\frac{1}{5}$.

Multiply. Check the work by going over it:

11. $\frac{2}{3}$ of \$1.05	$6 \times \frac{7}{8}$	$4\frac{3}{8} \times 52$	$14 \times 24\frac{3}{8}$
12. $\frac{3}{4}$ of \$1.75	$5 \times \frac{2}{3}$	$9\frac{1}{3} \times 65$	$32 \times 18\frac{5}{6}$

Divide. Write the remainder as a fraction in the quotient:

13.	$21\overline{)1095}$	$51\overline{)1437}$	$88\overline{)82950}$
14.	$19\overline{)1273}$	$15\overline{)6110}$	$65\overline{)41615}$
15.	$44\overline{)3839}$	$98\overline{)4126}$	$54\overline{)28310}$
16.	$27\overline{)6570}$	$24\overline{)1996}$	$35\overline{)21322}$



1. Mr. Green wants to plant an orchard of young peach trees. He finds that he can plant 15 rows with 20 trees in a row. At 30¢ each, how much will the trees cost?

2. Mrs. Smith bought $4\frac{1}{2}$ lb. of beef at \$.55 a pound She gave the clerk \$3.00. How much change did she get?

3. In 4 months Alice saved these amounts toward her summer vacation: \$1.85, \$2.15, \$2.78, and \$1.06. How much, on the average, did she save per month?

4. Jack wanted a book that cost \$1.80. The clerk had a soiled copy which he sold to Jack for \$1.25. For how much less than the regular price did Jack buy the book?

5. A train takes 19 hr. to make a 722-mile run. What is the average speed per hour?

6. Yesterday Ann weighed $65\frac{1}{2}$ lb. The doctor says that a girl of her height should weigh 72 lb. How many pounds should Ann gain?

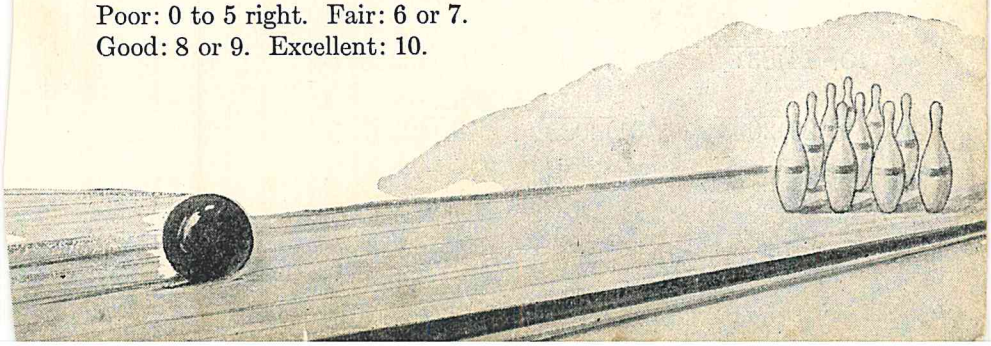
7. Jim's father bought 1000 tomato plants. If he puts 27 plants in a row, how many rows will he have?

8. Tom's mother paid \$7.20 for a 15-pound turkey. How much was that a pound?

9. George helps his father take care of the lawn. It is 45 ft. wide and 57 ft. long. How many square feet of lawn do George and his father take care of? How many square yards of lawn is that?

10. Jane needs 24 in. of silk for a pillow. At \$1.75 a yard, how much will it cost?

Poor: 0 to 5 right. Fair: 6 or 7.
Good: 8 or 9. Excellent: 10.



DO YOU NEED HELP?

If you miss more than one example in any row, turn to the Practice Pages for that row.

					PRACTICE PAGES
Add and check:					
1.	0.8 2.1 1.6	0.99 0.45 0.32	4.84 5.67 2.39	23.76 15.59 14.53	241, 243
Subtract and check:					
2.	3.0 0.8	51.4 12.5	4.40 1.74	64.32 46.59	241, 243
Multiply and check:					
3.	725 468	439 207	648 590	3809 38	24, 51, 96
Divide and check. Write R before remainders:					
4.	$43\overline{)705}$	$65\overline{)1704}$	$72\overline{)38592}$		57, 61
5.	$32\overline{)913}$	$93\overline{)8116}$	$64\overline{)12099}$		98, 99
6.	$24\overline{)407}$	$35\overline{)2746}$	$25\overline{)19178}$		104
7.	$36\overline{)847}$	$57\overline{)2787}$	$88\overline{)13743}$		140, 141
8.	$28\overline{)733}$	$46\overline{)3921}$	$76\overline{)39825}$		159, 161
9.	$35\overline{)708}$	$23\overline{)9899}$	$54\overline{)16592}$		162, 163
10.	$14\overline{)831}$	$15\overline{)8471}$	$16\overline{)13363}$		167
11.	$23\overline{)2093}$	$31\overline{)3038}$	$45\overline{)42397}$		222, 223

Diagnostic test.

DO YOU NEED HELP?

If you miss more than one example in any row, turn to the Practice Pages for that row.

Add. Check the work by going over it:

						PRACTICE PAGES
1.	$1\frac{3}{8}$	$2\frac{7}{10}$	$3\frac{1}{12}$	$2\frac{4}{5}$	$4\frac{5}{16}$	83, 93
	$2\frac{5}{8}$	$3\frac{9}{10}$	$4\frac{7}{12}$	$1\frac{3}{5}$	$5\frac{3}{16}$	94
2.	$4\frac{1}{2}$	$3\frac{5}{6}$	$1\frac{1}{4}$	$2\frac{2}{3}$	$3\frac{1}{2}$	130
	$3\frac{3}{5}$	$2\frac{1}{2}$	$3\frac{1}{8}$	$1\frac{2}{3}$	$2\frac{1}{6}$	
	$2\frac{9}{10}$	$1\frac{1}{3}$	$2\frac{1}{16}$	$3\frac{2}{3}$	$1\frac{1}{12}$	
3.	$6\frac{1}{5}$	$7\frac{1}{3}$	$3\frac{1}{2}$	$1\frac{1}{4}$	$9\frac{5}{8}$	187
	$2\frac{1}{2}$	$1\frac{1}{2}$	$5\frac{2}{3}$	$2\frac{2}{3}$	$4\frac{1}{3}$	
	$4\frac{2}{5}$	$2\frac{1}{3}$	$1\frac{2}{3}$	$5\frac{1}{4}$	$2\frac{7}{8}$	

Subtract. Check the work by going over it:

4.	$7\frac{7}{8}$	$2\frac{1}{4}$	$3\frac{3}{10}$	$3\frac{5}{12}$	$7\frac{9}{16}$	84, 85
	$2\frac{3}{8}$	$\frac{1}{4}$	$3\frac{1}{10}$	1	$7\frac{1}{16}$	
5.	$2\frac{7}{16}$	$3\frac{1}{3}$	$5\frac{9}{10}$	$6\frac{3}{4}$	$2\frac{3}{4}$	128, 129
	$1\frac{1}{4}$	$3\frac{1}{12}$	$3\frac{2}{5}$	$4\frac{1}{16}$	$1\frac{1}{8}$	
6.	4	$5\frac{1}{8}$	$3\frac{1}{6}$	$7\frac{1}{4}$	$3\frac{1}{3}$	185, 187
	$3\frac{1}{4}$	$2\frac{5}{8}$	$2\frac{1}{2}$	$3\frac{7}{12}$	$1\frac{1}{2}$	

Multiply. Check the work by going over it:

7.	$\frac{3}{4}$ of 48	$\frac{2}{3}$ of 60	$\frac{3}{8}$ of \$1.20	199
8.	$\frac{1}{6} \times 25$	$\frac{5}{8} \times 42$	$\frac{5}{6} \times \$1.35$	203
9.	$2\frac{1}{2} \times 18$	$3\frac{2}{3} \times 25$	$3\frac{3}{4} \times \$1.75$	206
10.	$6 \times \frac{4}{5}$	$18 \times \frac{7}{8}$	$14 \times \frac{2}{3}$	213
11.	$4 \times 9\frac{2}{3}$	$12 \times 16\frac{3}{8}$	$15 \times 33\frac{7}{8}$	214

Diagnostic test.

ARE YOU READY FOR THE NEXT GRADE?

If you can do the exercises on this page with few or no mistakes, you are ready for the next grade.

1. Say the answers to all the number facts on pages 4, 10, and 39 of this book. Then use the facts on page 4 as multiplication facts and say the answers.

Write in columns, add, and check:

2. 58,173 + 19,267 + 9006 + 10,838 + 46,775
3. 16.8 + 11.7 + 19.0 + 38.4 + 10.5 + 76.3
4. $4\frac{3}{4} + 6\frac{1}{2} + 5\frac{3}{16}$ $\quad$ $8\frac{7}{12} + 2\frac{1}{2} + 7\frac{1}{6}$

Subtract the smaller number from the larger:

5. 81,450; 59,296 $\quad$ 28.4; 49.3 $\quad$ $10; 5\frac{4}{5}$ $\quad$ $6\frac{2}{3}; 4\frac{3}{4}$

Multiply these numbers. Check by going over the work:

6. $\frac{3}{4}$ of 28 $\quad$ 52×3875 $\quad$ 607×943
7. $\frac{1}{5}$ of 47 $\quad$ $9\frac{3}{4} \times 375$ $\quad$ $15 \times 11\frac{2}{3}$

Divide and check:

8. $29\overline{)\$38.86}$ $\quad$ $25\overline{)18750}$ $\quad$ $42\overline{)41076}$ $\quad$ $56\overline{)\$506.89}$

Put the right number in each space:

9. 3 pk. = . . qt. $\quad$ 20 min. = . . hr. $\quad$ 20 qt. = . . bu.
10. 9 in. = . . yd. $\quad$ 20 oz. = . . lb. $\quad$ 500 lb. = . . T.
11. Find the cost of 14 oz. of meat at $.40 a pound.
12. Which garden has the larger area, one that is $8\frac{1}{2}$ ft. wide and 12 ft. long or one that is 9 ft. wide and $11\frac{1}{2}$ ft. long? How much larger is it?

Promotion test.

Linear Measure

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
$5\frac{1}{2}$ yards or $16\frac{1}{2}$ feet = 1 rod (rd.)
320 rods or 5280 feet = 1 mile (mi.)

Square Measure

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards = 1 square rod (sq. rd.)
43,560 square feet = 1 acre (A.)
160 square rods = 1 acre
640 acres = 1 square mile (sq. mi.)

Measures of Weight

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton (T.)

Measures of Time

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day (da.)
7 days = 1 week (wk.)
12 months or 365 days = 1 year (yr.)
366 days = 1 leap year
10 years = 1 decade
100 years = 1 century

Liquid Measure

2 cups = 1 pint (pt.)
2 pints = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

Dry Measure

2 pints = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

Basic Facts. In the early part of Grade 5 the pupils should be given the tests on pages 4, 10, 17, and 39 to see how well they know the fundamental number facts. A lack of mastery of any of these facts may handicap a pupil's progress in arithmetic.

The tests just mentioned are to be given orally to each individual pupil. As the pupil reads each fact on any given test he gives *only the answer*. He should not say "9 times 5 are 45" but only "45." When the pupil takes one of these oral tests, the teacher should check all the facts for which the pupil gives unsatisfactory responses. At the end of the test the teacher should give the pupil a list of these particular facts, with instructions to study them carefully. An unsatisfactory response is one that is incorrect or that is given with much hesitation, even though it be correct.

The time limit for each test is 2 to 3 minutes, depending upon the ability of the pupil and the part of the school year in which the test is given. If more time is required, it means that there are many facts which the pupil has not mastered. In giving each test it is as important to discover the delayed responses, even though they be correct, as it is to locate the incorrect ones. Written tests on the basic facts are not as satisfactory as oral tests since written tests do not indicate the delayed, though correct, responses.

The tests mentioned above will probably show that the pupils make more errors on the multiplication facts than on the addition and subtraction facts. For this reason, special helps in learning the multiplication facts are given on pages 18–21. These helps are not a substitute for the memorization of these facts; their sole purpose is to provide an easy way to get the correct answer to a fact that has been forgotten. It is expected that after using these helps a short time the pupil will then remember the correct answer. If the pupil forgets the answer to a division fact, he can get it quickly by relating the division fact to the corresponding multiplication fact as explained on page 40. A pupil should have no trouble with the division facts if he knows the multiplication facts.

Folded Paper. To avoid copying exercises in addition and subtraction, such as those in ex. 1 to 6 on page 7 and in ex. 5 to 8 on page 12, the pupil may write the answers on folded paper as follows: The pupil places the edge of a sheet of paper under ex. 1 on page 7, writing the answers along the edge of the paper. When ex. 1 is finished, the answers should be folded under; the answers to ex. 2 are then written along the folded edge, and so on. It will save time to fold the paper in advance, each fold being about 1 inch wide. The answers to any exercises in addition and subtraction may be written on folded paper if the teacher wishes.

Timed Tests. As the pupil progresses from grade to grade it is reasonable to expect that there will be a gradual improvement in the speed and accuracy of his computing, particularly with whole numbers. It seems important, therefore, beginning with Grade 5, to give timed tests about once a week to determine whether the pupil is acquiring that skill in computing that is desirable at the fifth grade level. Such tests are provided on pages 63, 103, 145, 191, 229, 259, and 301 of this book.

The method of giving one of these timed tests, such as the Addition Test on page 63, is as follows:

(1) Start all the pupils at the same time by saying "Go." Stop all pupils promptly at the end of 5 min., which is the time assigned for the Addition Test. Use a watch with a second hand to keep the time. For addition and subtraction tests the answers should be written along the edge of a sheet of folded paper, as described on page 308.
(2) Read the answers to the exercises. Then have each pupil count the number of exercises he has right. A partially completed exercise does not count.
(3) If the pupil has failed to finish the test within the time allowed, or if he has one third or more of the answers wrong, he needs more practice on such work. The teacher can assign practice, according to individual needs, from exercises in this book.

The time allowed for each test is a reasonable one. If the pupil has had sufficient practice in the fundamental operations, he should have no difficulty in completing any test in the assigned time, without hurry or nervousness. In giving these tests the teacher should not permit the pupils to consider them as a "race" to see who finishes first. Such a spirit of competition would defeat the purpose of the tests by overemphasizing the time element. These tests merely serve to determine whether a pupil can add, subtract, multiply, and divide with accuracy within a reasonable amount of time.

The fact that four tests appear on page 63 and on other such pages does not mean that all four tests are to be given the same day. Not more than one timed test should be given on any day. Since there are 28 timed tests in all in this book, it will be sufficient to give one of these tests about once a week.

The writing of answers on folded paper applies only to tests on addition and subtraction. For tests on multiplication and division, the exercises should be copied on a sheet of paper *before* the test is given. In copying the exercises the pupil should spread them over the sheet to allow ample space for the work.

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THE 100 ADDITION FACTS

0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9
0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1
1	2	3	4	5	6	7	8	9	10
0	1	2	3	4	5	6	7	8	9
2	2	2	2	2	2	2	2	2	2
2	3	4	5	6	7	8	9	10	11
0	1	2	3	4	5	6	7	8	9
3	3	3	3	3	3	3	3	3	3
3	4	5	6	7	8	9	10	11	12
0	1	2	3	4	5	6	7	8	9
4	4	4	4	4	4	4	4	4	4
4	5	6	7	8	9	10	11	12	13
0	1	2	3	4	5	6	7	8	9
5	5	5	5	5	5	5	5	5	5
5	6	7	8	9	10	11	12	13	14
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6	6	6	6	6	6	6	6	6	6
6	7	8	9	10	11	12	13	14	15
0	1	2	3	4	5	6	7	8	9
7	7	7	7	7	7	7	7	7	7
7	8	9	10	11	12	13	14	15	16
0	1	2	3	4	5	6	7	8	9
8	8	8	8	8	8	8	8	8	8
8	9	10	11	12	13	14	15	16	17
0	1	2	3	4	5	6	7	8	9
9	9	9	9	9	9	9	9	9	9
9	10	11	12	13	14	15	16	17	18

THE 100 SUBTRACTION FACTS

0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
1	1	1	1	1	1	1	1	1	1
0	1	2	3	4	5	6	7	8	9
2	3	4	5	6	7	8	9	10	11
2	2	2	2	2	2	2	2	2	2
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3	4	5	6	7	8	9	10	11	12
3	3	3	3	3	3	3	3	3	3
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6	6	6	6	6	6	6	6	6	6
0	1	2	3	4	5	6	7	8	9
7	8	9	10	11	12	13	14	15	16
7	7	7	7	7	7	7	7	7	7
0	1	2	3	4	5	6	7	8	9
8	9	10	11	12	13	14	15	16	17
8	8	8	8	8	8	8	8	8	8
0	1	2	3	4	5	6	7	8	9
9	10	11	12	13	14	15	16	17	18
9	9	9	9	9	9	9	9	9	9
0	1	2	3	4	5	6	7	8	9

THE 100 MULTIPLICATION FACTS

0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9
1	1	1	1	1	1	1	1	1	1
0	1	2	3	4	5	6	7	8	9
0	2	4	6	8	10	12	14	16	18
0	1	2	3	4	5	6	7	8	9
3	3	3	3	3	3	3	3	3	3
0	3	6	9	12	15	18	21	24	27
0	1	2	3	4	5	6	7	8	9
4	4	4	4	4	4	4	4	4	4
0	4	8	12	16	20	24	28	32	36
0	1	2	3	4	5	6	7	8	9
5	5	5	5	5	5	5	5	5	5
0	5	10	15	20	25	30	35	40	45
0	1	2	3	4	5	6	7	8	9
6	6	6	6	6	6	6	6	6	6
0	6	12	18	24	30	36	42	48	54
0	1	2	3	4	5	6	7	8	9
7	7	7	7	7	7	7	7	7	7
0	7	14	21	28	35	42	49	56	63
0	1	2	3	4	5	6	7	8	9
8	8	8	8	8	8	8	8	8	8
0	8	16	24	32	40	48	56	64	72
0	1	2	3	4	5	6	7	8	9
9	9	9	9	9	9	9	9	9	9
0	9	18	27	36	45	54	63	72	81

THE 90 DIVISION FACTS

1	2	3	4	5	6	7	8	9
1)1	1)2	1)3	1)4	1)5	1)6	1)7	1)8	1)9
1	2	3	4	5	6	7	8	9
2)2	2)4	2)6	2)8	2)10	2)12	2)14	2)16	2)18
1	2	3	4	5	6	7	8	9
3)3	3)6	3)9	3)12	3)15	3)18	3)21	3)24	3)27
1	2	3	4	5	6	7	8	9
4)4	4)8	4)12	4)16	4)20	4)24	4)28	4)32	4)36
1	2	3	4	5	6	7	8	9
5)5	5)10	5)15	5)20	5)25	5)30	5)35	5)40	5)45
1	2	3	4	5	6	7	8	9
6)6	6)12	6)18	6)24	6)30	6)36	6)42	6)48	6)54
1	2	3	4	5	6	7	8	9
7)7	7)14	7)21	7)28	7)35	7)42	7)49	7)56	7)63
1	2	3	4	5	6	7	8	9
8)8	8)16	8)24	8)32	8)40	8)48	8)56	8)64	8)72
1	2	3	4	5	6	7	8	9
9)9	9)18	9)27	9)36	9)45	9)54	9)63	9)72	9)81
0	0	0	0	0	0	0	0	0
1)0	2)0	3)0	4)0	5)0	6)0	7)0	8)0	9)0

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